HORSELESS AGE The oldest automotive paper published in the English language has been purchased by The Class Journal Co. Its engineering features and a part of its circulation, have been merged with AUTOMOTIVE INDUSTRIES

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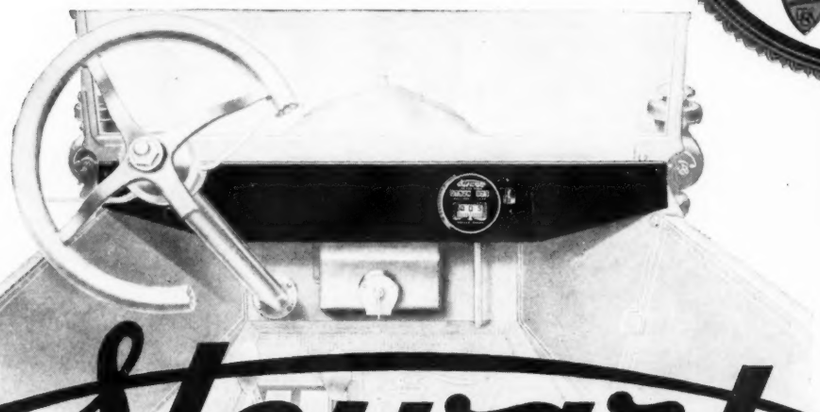

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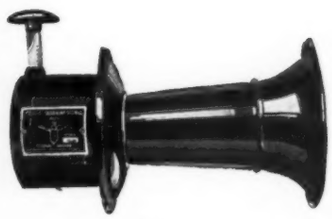

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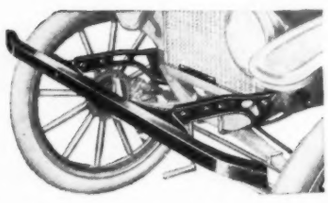

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XL NEW YORK—THURSDAY, JANUARY 2, 1919—CHICAGO NO. 1

France's Post-War Automobile Program

Industry Disturbed Over Import Duties—Plants Greatly Expanded But Unable to Get Into Quantity Production for Some Time—Types of Cars Reduced—Preference for Vertical Six—Small Four to Be Most Popular—Expect Big Tractor Development

By W. F. Bradley

THE armistice, coming much quicker than was ever thought possible, found the French automobile industry generally ill-prepared for normal business. There are two dominant questions troubling the leaders: The first is what import duty will be established by France and the other, whether England will depart from its free trade policy.

For over a year there has been a 70 per cent ad valorem import duty on automobiles and parts brought into France. This, however, was admittedly a temporary war measure, the ordinary duty being on a weight basis and being roughly equivalent to 10 per cent on the price of the machine.

French manufacturers would like to see this 70 per cent duty continued for one year after the signature of the peace terms, to be followed for a period of one year by 50 per cent, then 20 per cent. This protection is obviously directed against America, the only nation in a position to make quick deliveries of automobiles.

While anxious to get a protective wall for themselves, the French trade is nervous less England put up a protective tariff. The anxiety can be understood, when it is remembered that France, before the war, was the biggest motor exporting nation in the world, with a value of $45,000,000 in 1913, and that it was in England or through England that the greatest volume of business was transacted.

Now the English motor industry—which must not be confused with the English nation—is just as anxious to get protection as are the French automobile manufacturers. And this protection is desired primarily against America.

There are all kinds of scares abroad in France to show the necessity of a protective tariff. The latest is that the British and the American Governments have stipulated that none of their automobiles, sent over for war purposes, shall be allowed to return to the country of their origin. There is not a grain of truth in the whole thing, for the English are preparing to receive all their war worn trucks from France, and the Motor Transport Corps of the American Army is arranging to ship across the Atlantic all such vehicles as are worth returning. This is known to the scare-mongers, but they have not taken the trouble to correct the false reports. Other "authoritative" persons state that the American Air Service will turn all its vehicles over to the Belgians. The fact is that the Air Service has no authority to dispose of any automobile, the control being in the hands of the Motor Transport Corps.

France Has Little to Fear

France really has little to fear from an invasion of her own territory. If the old tariff goes into force again some of the cheapest makes of American cars can be sold on a price basis. In the medium car class local competition will be so keen that it is doubtful if American firms will be interested in the market.

The highest class of American automobiles never have threatened France. Trucks can be produced very much quicker than touring cars, so that there will be no

gap during which the American maker will have the market to himself. Further, the military subsidy scheme puts all foreign truck makers at a disadvantage. What France needs much more than protection for her own shores is protection for her export trade—a thing not easy to obtain.

French factories cannot possibly make deliveries in any quantities before the middle of 1919, and there is a fear that America, whose industry has been less disturbed than that of France, will have got a good hold of the foreign markets in the meantime.

As the automobile factories, in common with other engineering concerns, have been increased in size and have been modified in order to meet the needs of the nation, it is quite natural that the Government should be interested in getting them back to normal working conditions.

The Ministry of Armaments has been transformed into the Ministry of Industrial Reconstruction, with Mr. Laucheur at its head, and will have as its big task the organization of the resources of the country for peace. Measures are to be taken to facilitate the transformation of factories having worked for the Government, and among these measures will be important orders given to the automobile factories for agricultural tractors and machinery, internal combustion motors for the merchant-marine, and work for the postal and telegraph departments.

This Ministry will also be responsible for the allotment of raw material to the factories. For more than 2 years it has been impossible to secure an ounce of metal without a military order. Although the war is practically over, this restriction still remains, and the automobile industry is looking to the Government for action to release supplies of raw material. In very many cases the supply of raw material will be the determining factor in the production of trucks and cars for civilian use.

French Plants Greatly Expanded

The French automobile factories have two features in common: they have all increased enormously in size, and they have all completely modernized their plants. The number of workpeople at the present time engaged on purely automobile work is estimated at 800,000. During the war not a single one of the factories has been kept exclusively on automobile work; yet the change has made itself felt in varying degrees.

The biggest automobile producers during the war have been Renault, Berliet, Panhard-Levassor, Saurer, Delahaye, De Dion Bouton. But these firms have not by any means been exclusive producers of trucks and cars. Renault specialized on aviation engines right at the beginning, then extended to planes, and for the last year has been a big producer of tanks. Berliet has been a producer of aviation engines and tanks. De Dion Bouton has built Hispano-Suiza aviation engines, gun carriages, searchlights and motorized artillery.

There are automobile factories which for 3 years have not built a single automobile. Darracq is in this class, the whole factory having been turned over to aviation engines and planes, machine guns, etc. Delage transformed his modern plant into a shell producing factory right at the beginning; in 12 months he had covered the whole of the ground he considered would suffice for 10 years' normal development, and during the last 18 months he has been building series of passenger cars for staff use. Hispano-Suiza, whose aviation motor has been produced in bigger numbers than any other in the world, has been forced to abandon all thought of automobile production.

Firms which have received army orders for passenger cars are naturally in a better position than those having worked on other classes of goods. Some of these firms have been building what may be considered as peace models for over a year, and have had the opportunity of watching them in service with the army. Thus, while some will soon be ready to settle down to production, other firms are still confined to drawing office activities.

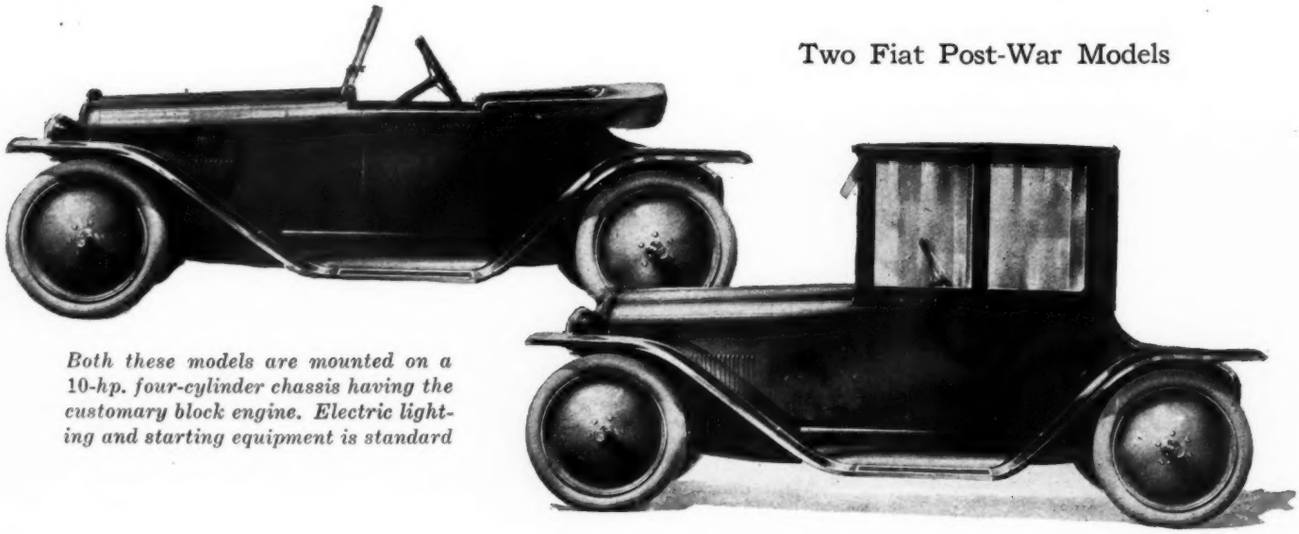
What the Future Holds

It is possible to give a general forecast of what future lines of development will be. Throughout France and Italy the tendency of the war has been to make the big firms more and more independent of outside supplies. The specialist idea has not taken hold. Some of the newcomers will produce cars with engines from A transmission from B and rear axle from C, but all the big, well-known firms have become entirely independent.

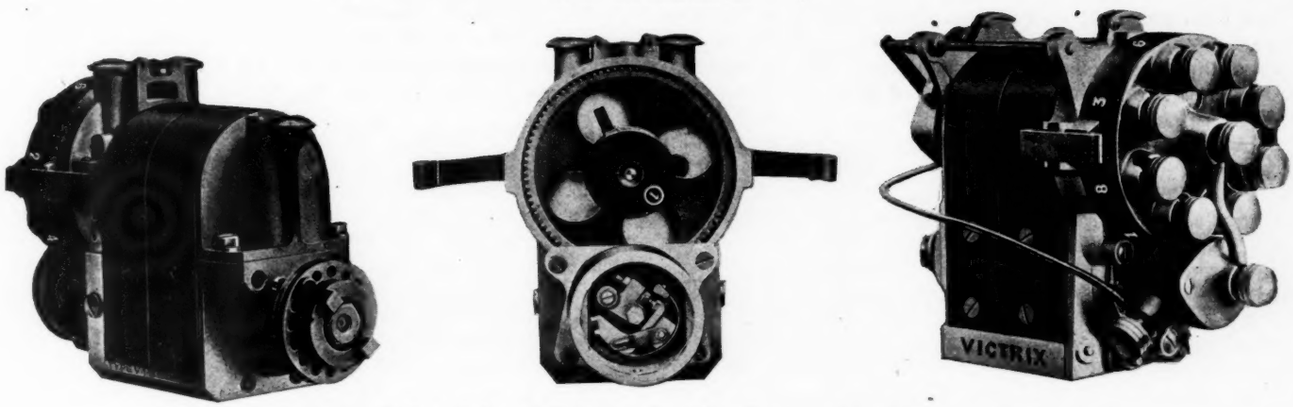
The most notable example is the Fiat Co., at Turin, Italy, which has grown to 40,000 workpeople, and now produces its own castings, forgings, ball bearings, magnetos and bodies—in fact everything but tires.

In France, Renault has followed on the same general lines, for although he does not build his own magnetos he controls the company supplying him with these organs. De Dion Bouton has been building magnetos in its own factory for 2 years and will continue to supply its own wants and meet those of some outsiders.

Two Fiat Post-War Models



Both these models are mounted on a 10-hp. four-cylinder chassis having the customary block engine. Electric lighting and starting equipment is standard



Victrix magneto which is being built in the De Dion Bouton plant for use on De Dion cars

As practically every European after-the-war car will be built with electric lighting and starting, designers no longer look upon the magneto as an absolute necessity and several have eliminated it in favor of battery ignition. Others admit that if they have not done so at once it is because they are afraid of public opinion. French motorists in particular have been educated to the belief that the only perfectly reliable ignition is by high tension magneto.

All firms have cut down on the number of types of cars, but very few have decided on a single model. Two will probably be the average. The big firms, too, are going to continue building touring cars and trucks, with, in many cases, agricultural tractors in addition. Four cylinders are going to remain in the majority, but there will be many more multi-cylinder engines than was the case in 1914.

Vertical Six Preferred

The preference appears to be for the vertical six, followed by the eight, with the twelve last. Thus, the Hispano-Suiza company, which has been all out on aviation eights for three and a half years, considers that six cylinders are sufficient for a high-grade touring car. Fiat, after building sixes and twelves for air work, limits itself to sixes for touring car work.

Detachable cylinder heads will be adopted much more extensively; thermo-syphon cooling will gain some ground for the smaller motors, but not for the big ones; unit construction of motor and gearbox is going to be a very strong feature; the tendency is to get away from chains for driving camshaft and auxiliaries; cylinder capacity of motors is being reduced; at the same time there is an important saving in the total weight of cars; high-grade alloy steels, which before the war were used only in aviation motors and a few racing and special cars, will be made use of for the normal production.

With unit construction of motor and gearbox both brakes are being put on the rear wheels, but in all cases they are internal expanding, not external. There will be several cases of brakes on the propeller shaft, behind the axle. Front wheel brakes are going to be used on many of the higher class cars. Gearsets will remain with four speeds and reverse. Springing is strongly towards cantilever, with a tendency in the direction of quarter elliptic for light cars. Wheels will be metal, to the exclusion of wood. The vacuum gasoline supply system is going to be adopted rather extensively.

Not many firms have announced their complete post-war program. The De Dion Bouton company, which was erroneously stated a few weeks ago to have passed into new hands, has just made it known that it will establish an erecting plant in England, this to be supplied with motors and transmissions from the French factory.

The program of this firm covers two eight-cylinder motors and two fours fitting into two chassis. Thus, one chassis will be furnished with an eight-cylinder V motor of 60 by 100 mm. (2.3 by 3.9 in.) or with a four-cylinder monobloc of 70 by 120 mm. (2.7 by 4.7). The second chassis will be equipped with an eight of 70 by 120 mm. (2.7 by 4.7) or a four of 85 by 130 mm. (3.3 by 5.1 ins.).

Fours and Eights for De Dion

In all four cases motor and gearset will form a unit construction mounted in the main frame by three point suspension. In all models the De Dion Bouton engineers have decided on a two bearing crankshaft. They will not be alone in this line of development, although 85 by 130 mm. is a bigger motor than has usually been considered suitable for a two bearing shaft.

De Dion Bouton has been building the Victrix magneto in his own shops for a considerable time and will use these on all passenger cars and trucks. Electric lighting and starting will be found on all passenger cars, a single unit being employed, and the whole installation built in the De Dion Bouton factory.

Fiat has announced much of its new program. The models will be four in number: an 8-hp. two seater (built with both open and closed body); a 12-hp. four-cylinder light touring car, with open body; a six-cylinder of less than 3 in. bore, and a high-class six of about 3½ in. bore. Some of the new features are electric lighting and starting for all models, detachable cylinder heads, unit construction of motor and gearbox, spiral bevel rear axle.

Delage is producing a high-class six, with unit construction, electric lighting and starting, and front wheel brakes. The Hispano-Suiza company, which was fully expected to come out with an aluminium eight, states that its leading model will be a high-grade six with valves in the head.

Small Four Will Be Popular

The most popular type of car is going to be a 10 hp., four cylinder with electric lighting and starting and a 2, 3 or 4 passenger body. The Citroen company announced that it will build a car of this type with a four-cylinder motor of 65 by 100 mm. bore and stroke (2.5 by 3.9 in.). It is commonly reported that the price will be around $1,000, but this is really mere speculation, for it is doubtful if even the Citroen company knows exactly at what price the car can be sold.

With the price of most steels five times higher than in 1914, it is going to be a difficult task for any firm to build a $1,000 car in France for the first year after the war. The Citreon company is one of the biggest

and best managed in France. Before the war the firm was chiefly interested in cutting gears, but Andre Citroen, the president of the company, was also president of the Mors Automobile Company and had other and close connections with the automobile industry. There is no doubt that Citroen will be a leading figure in the popular car class.

Peugeot is another firm having already got into this 10-hp. class, with a popular four cylinder model of 68 by 100 mm. bore and stroke. Some of these have been delivered during the war to the French army. Fiat is going to appear in about the same class.

Whereas before the war the most popular type of automobile in France had cylinder dimensions of about 80 by 130 mm. (168 cu. in. piston displacement) the post-war corresponding type will be reduced to about 90 cu. in. Some of the engineers claim that as there has been a corresponding reduction in weight and an increase in efficiency, these smaller motors will do all that was obtained from the larger ones in 1914.

Expect Big Tractor Development

Important developments can be expected in the production of agricultural tractors. Apart from the fact that the efficiency of French farms was low by reason of old-fashioned methods, horses have become so rare since the war that there is no alternative but to make use of gasoline tractors on the land. Many of the automobile factories are looking to agriculture to keep their works running, and the Government has pledged itself to encourage the development of the French agricultural tractor by all possible means.

One of the most important problems to be solved without delay is the supply of gasoline for civilian uses. The whole question has been put into the hands of the Government Committee known as the General Gasoline Committee, which has authority not only to improve methods of transportation, but to discover national supplies of fuel. No automobile owner can obtain fuel without an official permit, and these permits are only given parcimoniously to persons doing work of national importance. Travel restrictions have become easier since the signing of the armistice, but owing to the impossibility of getting gasoline it is not possible to use a car for anything but local service.

Since the General Gasoline Committee got to work there has been some improvement, although it is hardly visible to the private owner. In 1917 the imports of gasoline were 400,000 tons per annum. In 1918 they had been increased to 1,000,000 tons a year, and the reserve stocks had been increased sufficiently to allow private interests being considered. Not much improvement took place, however, owing to defective transportation methods in the interior of France.

Many Districts Without Gasoline

Certain important districts have been six months without receiving a single drop of gasoline for any civilian use. The number of tank cars has been increased; permission has been given to fill cans from the tanks in railroad stations; in certain districts army automobile trucks are to be used to deliver gasoline. The one gallon cans which are so extensively used in France are to be replaced in an important measure by 10 gal. cans, and the supply of cans has to be pooled. In the past refiners only received their own empty cans.

An early improvement in the gasoline situation is now being promised by the authorities. In October last Marshal Foch reserved 10,000,000 gal. of gasoline for the monthly use of the French army alone. The military requirements have decreased to such an extent that for the present month of December it is expected to be able to allot an extra 15,000 tons of gasoline for civilian use. It is quite probable that in a short time all gasoline restrictions will be removed.

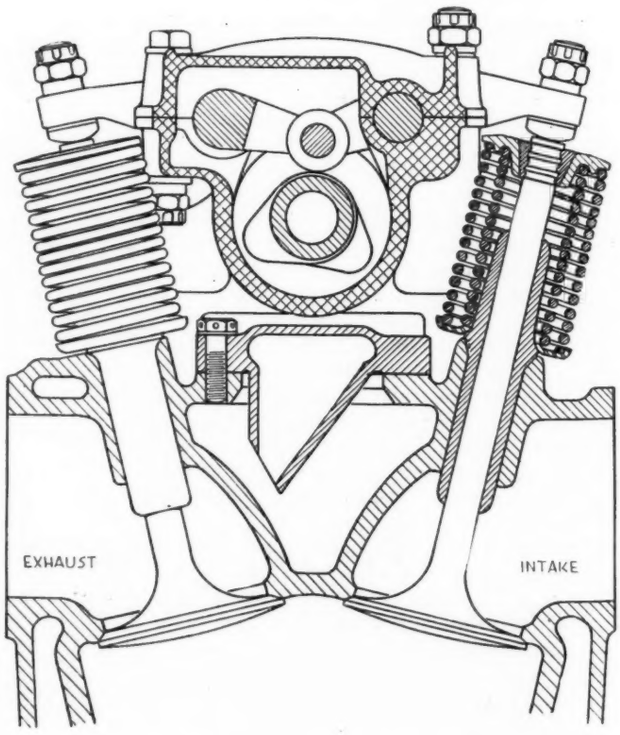
Mixed Fuels to Be Used

The present price of gasoline in the neighborhood of Paris is $1 per gallon, running to $1.25 in out of the way districts. For truck work in particular it is believed that the national fuel will be a mixture of 50 per cent of alcohol, 25 per cent benzol, and 25 per cent gasoline. An important group of truck owners, among which is the Paris General Omnibus Company, has announced its intention of absorbing as much of this fuel as can be produced in France during the next four or five years.

There is a decided tendency toward both racing and competition work. One of the best suggestions made is that a race or an important touring competition should be held in Alsace or in Lorraine during 1919. There is every reason to believe that this suggestion will be acted on, though it is not yet known what form the competition will take.

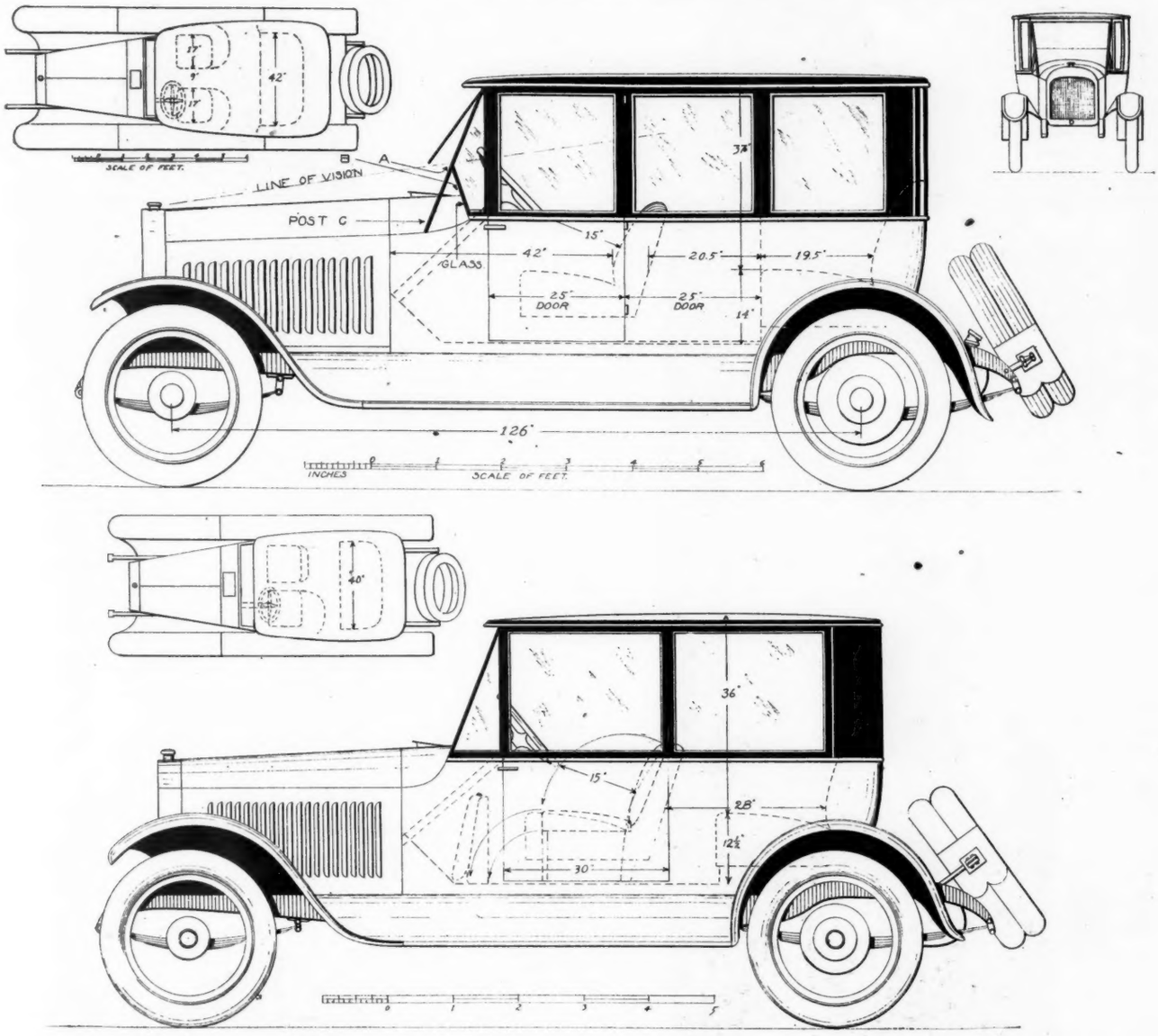
The only racing cars in Europe are a set of Sunbeams in England, two Fiats in Italy, and three Peugeots of only 2½ litres cylinder capacity. These latter were built for a race interrupted by reason of the war. Several firms have the advisability of racing under suggestion. One important organization has guaranteed to get a set of cars ready and a complete team together in 4½ months. These cars would be available for either America or France, according to which country takes up racing first. A month ago the idea of any race or road competition being held in 1919 was considered foolish; now it is very much to the fore.

The automobile paper *l'Auto* has announced that it will hold a competition for marine motors at the end of May and a competition for farm tractors at the end of April. It is undoubtedly in this direction that there is the greatest need for improvement in France.



Large-scale view of Liberty valve mechanism

Front Entrance Inside Drive Body



THE tendency at this time to make all inside drive bodies as small as possible has brought into favor the front entrance type, with the collapsible seat on the right side.

The illustration shows how this works. The driving seat on the left side is comfortable and stationary, and the seat at the rear is a good width for two passengers, with ample room back of the front seat. In addition this seat is forward of the axle and for that reason will be very comfortable to ride in.

The folding seat, as indicated in the side view, is shown in the two positions, the position for use and when folded down. It is intended that when the door is opened for entrance this seat will always be folded, and when there are only three passengers the seat can be left in the folded position.

The stock seat sold for this purpose is not suitable; a special seat will have to be made, as it must be more comfortable and with larger seat cushion and higher back than the regulation auxiliary seat. This must be made to be used for continuous riding and should be just as satisfactory to ride on as the driving seat, with the exception that the cushion cannot be so thick on account of its being made to fold.

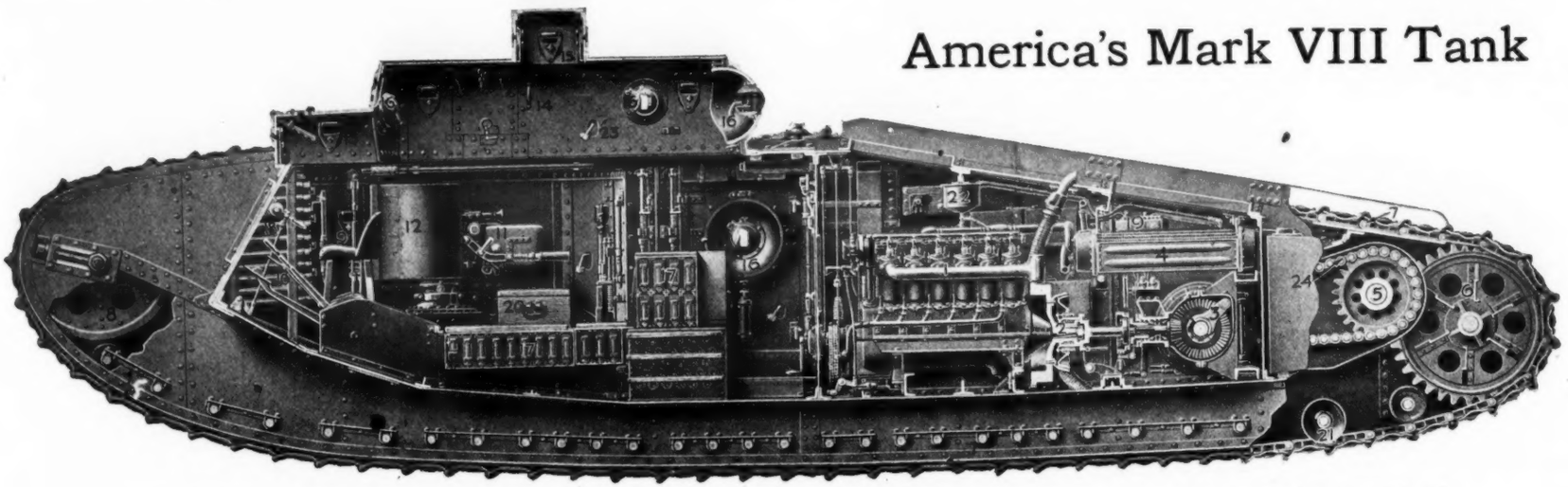
One of the advantages of this design is that the windows are very large, and all side windows, except the triangular one at the front, are made to drop flush, so that the side will be entirely open, except the slight obstruction made by the door pillars, which, as illustrated, are very small. All windows are designed to be operated by regulators.

The large side windows necessitate large doors, which are an advantage, as the doors open almost direct to the rear seat. It is customary for the passengers in the rear and the driver to be seated when the folding seat is set in position for the fourth passenger. It is possible, however, for the driver to get in from the left side without disturbing the passenger at his right.

The height of this body is less than the average, being

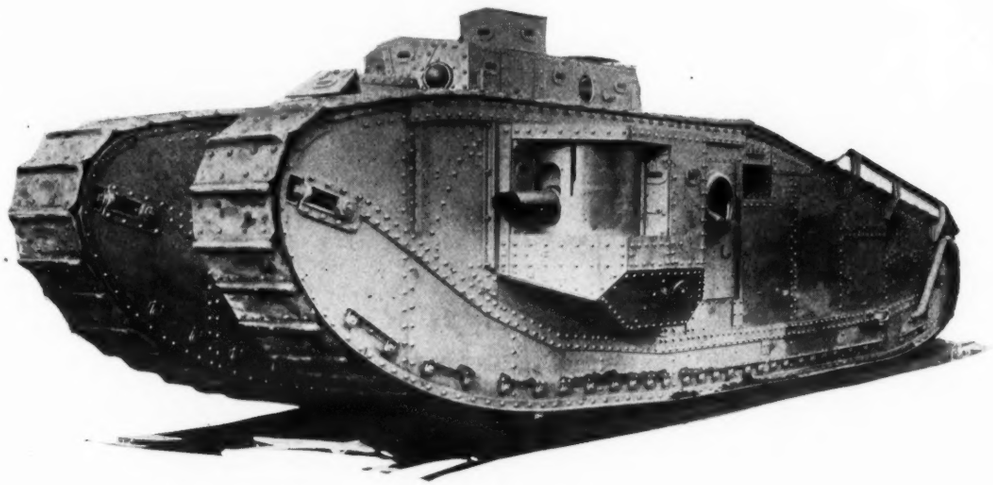
(*Continued on page* 39)

America's Mark VIII Tank



Section through the Mark VIII tank showing the layout of the interior with the locations of the most important parts in the fighting compartment and in the engine room.

1—*Liberty Engine*
2—*Clutch*
3—*Epicyclic transmission*
4—*Radiator*
5—*Roller sprockets*
6—*Road track driving wheels*
7—*Road track*
8—*Road track adjusting wheel*
9—*Driver's seat*
10—*Control levers*
11—*Six-pounder gun*
12—*Right hand sponson*
13—*Driver's turret*
14—*Main turret*
15—*Lookout turret*
16—*Machine gun mount*
17—*Machine gun ammunition*
18—*Six-pounder ammunition*
19—*Gasoline tank*
20—*Officers' kit box*
21—*Road track rollers*
22—*Gasoline regulator tank*
23—*Revolver hole*
24—*Drive chain*



The Mark VIII Land Cruiser

Technical Description of Large Sized Battle "Tank" Developed During the Latter Period of the War—Equipped with an Adaptation of the Liberty Aircraft Engine; Weight Complete, 40 Tons

By J. Edward Schipper

THE cessation of hostilities upset the plans of the War Department for the production of 1500 of the largest tanks ever made. These tanks, known as Mark VIII, were to be a joint product of Great Britain and the United States, the hull, armament and parts of the equipment being furnished by Great Britain, while the powerplant and most of the propulsion units were to be supplied by the United States. Assembly was to have taken place in France.

The tank is 34 ft. 2½ in. long, carries a crew of eleven men and is propelled by a Liberty engine, modified to a certain extent to make it more suitable for this class of service. This large machine is bigger than the British Mark V tank, which proved so successful during General Byng's attack last year at Cambrai. The principal modification to the Liberty engine consists in the substitution of cast iron for steel cylinders. The Navy "20 per cent" piston is employed.

The Mark VIII tank is an armored track-laying type of fighting tank in which the hull or body acts as the structural frame as well as a housing for the propelling and fighting units and crews. It has no chassis or supporting frame structure, and rather resembles naval craft, as the hull carries within it the entire mechanism and all of the running gear except the track links, which pass around the hull in the form of a continuous belt on each side of the tank.

From the twelve-cylinder Liberty engine the power is transmitted through a planetary gearbox and through a chain drive, which latter turns the driving sprocket of the track. The length of the track belt allows the tank to accommodate itself to inequalities of the ground, while at the same time providing a rail surface for the supporting rollers.

The tank is 12 ft. in width and the overall height is 10 ft., 3 in. The engine and driving members, including the clutch, the planetary transmission and chain drive, are located in the rear of the hull. The engine, together with the clutch and planetary gearing and other necessary engine parts, occupies the engine room, which is 9 ft. 9 in. in length.

Fighting Room Ahead of Engine

From the rear of the engine room back to the center of the track-driving wheel is 4 ft. 8⅛ in. In front of the engine room is the fighting and operating room, at the forward end of which is the driver's seat with the control levers. On either side of the fighting compartment there is a sponson or projecting swinging structure carrying a 6-pounder gun. The sponsons contain gun mountings capable of giving a wide radius of fire with the 6-lb. guns. In addition, the sponsons themselves may be swung back into the interior of the fighting compartment to reduce the width of the machine to permit it to be located on a standard railway car.

Mounted above the fighting compartment is the main turret, which carries five machine guns. Above the main turret is the directing officer's conning tower, from which it is possible to obtain vision on all sides of the machine and from which its movements may be directed. Within the fighting compartment are sufficient ammunition storage provisions for both 6-pounder and machine guns. The fighting compartment is entered through a door on either side and machine guns are also mounted in the doors. This gives a total of seven machine guns, five in the main turret and two in the doors; and two 6-pounders, one located in each sponson.

The fighting compartment is separated from the engine room by a bulkhead fitted with sliding doors.

The sides of the hull are extended to provide a guide for the track. The rear extension contains the housing for the chain drive and the track-driving sprocket, and the forward extension carries the track adjusting wheel, which can be moved forward or backward to tighten or loosen the track chain.

Steering Effected by Track

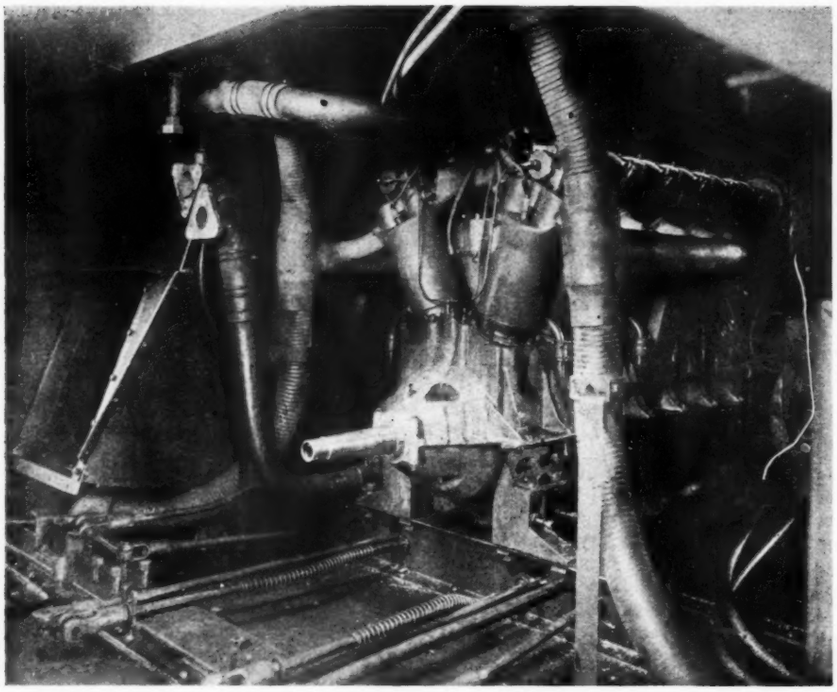
Steering is effected by allowing the track on one side to move at a faster rate than the track on the other, which tends to swing the machine in the direction of the slow-moving track. If one track is locked and the other track is allowed to move ahead, the machine will be turned in the shortest possible radius. The radius in which the machine can be turned depends to a large extent upon the nature of the ground, as, owing to its weight, it will dig up the ground to the side as it is being turned, which will impede the rate at which it can be swung around and will sometimes necessitate a wider turning arc.

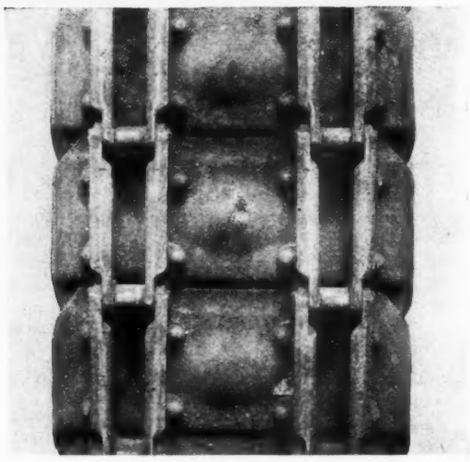
Control of the engine, clutch, planetary gear reduction, steering, etc., are all taken care of from the driver's seat, which is located in the forward end of the hull. It is of such a height that the driver's head is within a box-like structure at the front end of the main turret. Slits are cut in this compartment which allow the driver to look either side or ahead. The slits can be closed by rotating protecting shields when under fire, and when not under fire the driver can raise a hinged door at the front of the turret, affording an unobstructed view ahead of the machine.

In addition to the spark and throttle levers and other engine controls, the driver has four levers and a pedal. The two inside levers control the planetary transmission. The left outside lever controls the clutch and the right outside lever is for reversing the pedal, which is in the center of the track brake. When either transmission control lever is in neutral the track brake on that side can be applied, so that shifting both levers to neutral permits applying track brakes to both tracks.

The gasoline supply is carried in three tanks, of 80 gal. capacity each, mounted near the rear of the machine, just below the top plating. These tanks are all similar, and are mounted side by side. The gasoline is forced by pressure from these three tanks to a gravity tank mounted directly above the engine, from which it flows by gravity and pressure to the two carbureters. Pressure is supplied by the engine-driven air pump, a four-cylinder design, operated by the camshaft. The gasoline tanks are placed to the rear of the engine room and separated from it by the bulkhead.

The air pump is mounted just above the clutch, and is driven by a belt from the pulley on the engine shaft brake. The pulley on the air pump operates a camshaft, which works directly against the pistons or plungers of the pump. With the engine at rest sufficient pressure can be secured to start the flow of fuel by means of a hand pump, which is located





Above—A view of the engine room, with the Liberty motor in position. Right, top—Method of guiding in track. Right, bottom—Inside of track, showing rollers, links and rail surfaces

on the bulkhead between the engine room and fighting compartment. Each of the three tanks communicates with the gravity tank above the engine through a pipe containing a cock, and each tank can be turned on or off at will.

The hull of the tank is composed of armor plate of various thicknesses, ranging from ¼ in. to a little more than ½ in. This armor plate, which is 0.6 in. thick in practically all exposed parts of the hull, is capable of withstanding direct hits from machine guns or rifles and will turn heavier ammunition if struck at an angle. It takes a direct hit from a fairly large piece of artillery to put one of these tanks out of commission. For this reason it is invulnerable to the fire of infantrymen or machine gunners.

Complete Machine Weighs 40 Tons

Inasmuch as the complete machine weighs approximately 40 tons, the clutch has been designed to gradually overcome the inertia of the heavy mass, providing first a slipping and then a positive engagement. The slipping engagement is secured by means of an asbestos-faced cone clutch which comes into play first as the asbestos facing and the cone-shaped surface of the flywheel come in contact. Later positive engagement of the clutch is secured by splines or teeth on the clutch sleeve, which mesh with corresponding splines or teeth on the end of the crankshaft.

The function of the frictional part of the compound clutch is to pick up the load, setting the transmission drums in rotation. After the frictional part of the clutch has accomplished this the positive clutch is engaged. The driving clutch unit is bolted to the flywheel of the engine and is a conical frustrum of carbon steel. Pressure is applied to the cone by a large clutch spring concentric upon the clutch shaft. This spring is 5⅜ in. in diameter and has a coil length of 4¼ in. The clutch sliding collar or sleeve and the cardan shaft are joined by a nickel steel coupling.

The planetary gearset has two forward and two reverse speeds. It is mounted transversely on the machine in the rear end of the engine compartment. It provides the necessary gear reduction between the engine drive and the track propulsion units, and also carries the drive outward on both sides from the center line of the machine to the outside track mechanism.

The planetary gearset is not direct-connected to the engine but is driven from it through a pair of bevel gears. For reversing, the gears are shifted in relation to one another by means of a shifter fork mechanism, and the high and low speeds are secured by means of brakes, which act on drums forming part of the planetary gearbox. The reductions in the box are 5 to 1 on low and 1.285 to 1 on high. The reduction by the bevel gearset is 14:46. The reduction between the chain sprocket and the roller pinion is 12:23, and that between the roller pinion and the track driving wheel 9:37. This gives a total reduction between the engine and track of 32,545:1 on high speed, and 126.64:1 on low speed.

The use of the planetary type of gearbox on a machine of this weight does away with the necessity for shifting gears except for changing from forward to reverse. It is highly necessary, therefore, to strictly observe the precaution of allowing all moving parts to come to rest before shifting from forward to reverse,

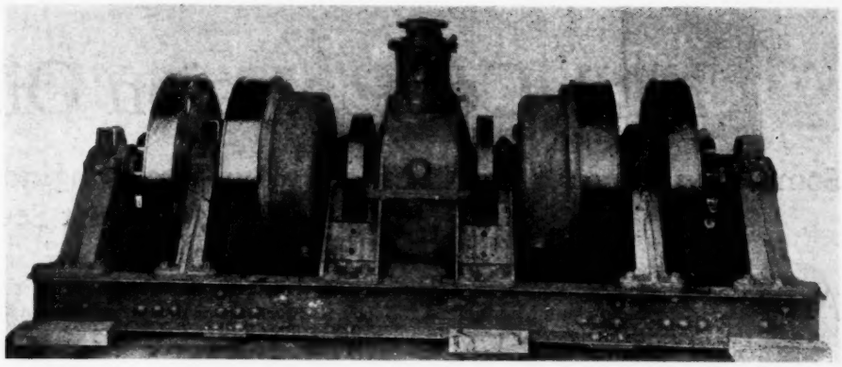
The bevel gear drive from the engine to the planetary gearset comprises two bevel wheels. Facing toward the front of the machine, the left bevel wheel provides the reverse motion and the right bevel wheel gives the forward motion. The proper bevel wheel for either direction of motion is engaged by means of a dog clutch, which slides on the splines of the cross shaft. Both bevel wheels are in constant mesh with the bevel pinion, but only one is fast upon the shaft at a time;

Left—Upper road track roller. Center—Lower road track roller without springs. Right—Lower road track roller with springs

the other acts simply as an idler, and has no part in the driving.

From the bevel wheel engaged by the dog clutch the drive passes to the cross shaft and thence to the sun pinion at the opposite end of the cross shaft from the bevel wheels. The sun pinion meshes with the large planet pinion, and this in turn meshes with the ring gear secured to the gear casing. This casing carries with it the low speed brake, the same bolt passing through the ring and the two halves of the casing.

When not restrained by the application of the brake the casing carries the drive back to the chain drive sprocket. The gear casing also carries a pin, upon which is mounted a small planet pinion, which meshes with a small gear ring carried on a disk, which in turn is splined to the cross shaft. Revolving with the disk which carries the spindle for the small pinion is the high speed brake.



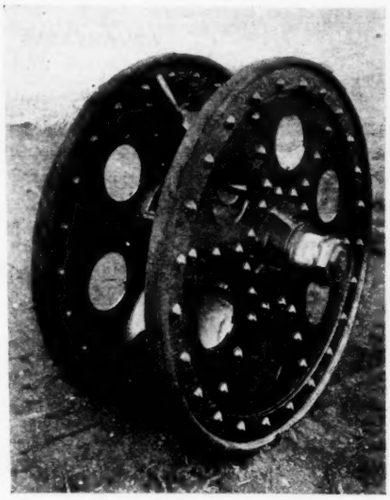
Exterior of the double compound epicyclic transmission on Mark VIII tank

Driving Sprocket

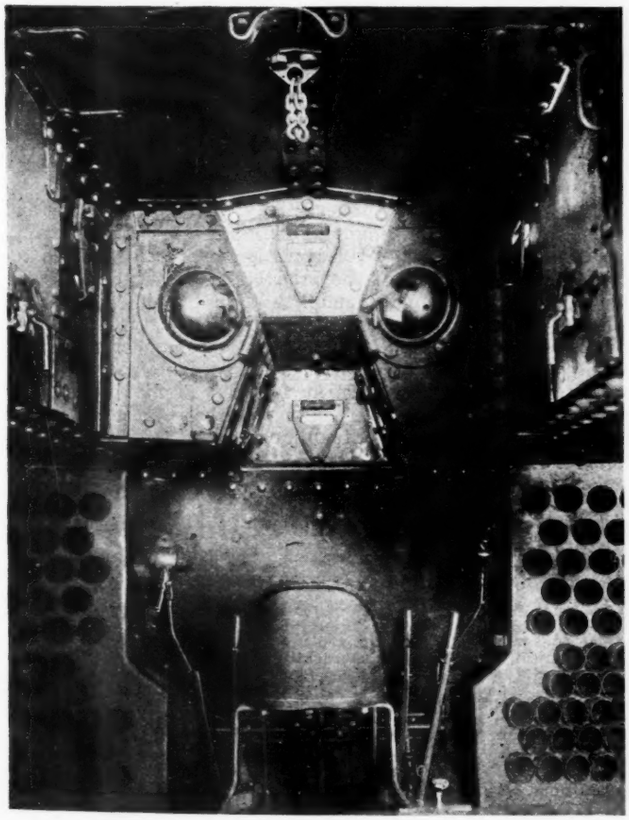
From the planetary gear the power is transmitted to the track by means of a driving chain. The driving sprocket is mounted on the planetary cross shaft and connects through the chain with the sprocket wheel at its center and which is located midway between the two roller pinions. These roller pinions mesh in turn with the road track driving wheel, which engages directly with the track.

The road track, in the form of a continuous belt, runs around the entire hull. There are fifty-eight rollers which carry the weight of the machine. In addition

Road track driving wheels



Road track adjusting wheels



Driver's seat and driving compartment of Mark VIII tank

to these lower rollers there are two upper rollers serving as guide for the track. Of the fifty-eight rollers, twenty-eight are fitted with spring plates which act as spacers. Since the road track is double, these spacers keep the rollers the proper distance apart. The two top road track rollers are alike. One is located on each side at the point where the track makes its sharpest angle and where, consequently, the greatest strains may be expected. Elsewhere along the top the track slides on the top track rails.

Track Links

The track links are of drop-forged steel, having a length, from pin center to pin center, of 11.154 in. These links must be very accurately assembled, the allowable limit between pin centers being 0.004 in.; *i. e.*, when links are assembled in pairs they must agree to within .004 in. between pin centers. The links perform the double duty of binding the chain together, and also of forming a rail surface upon which the machine rolls. It takes a left and right link bar to make up one link assembly. These bars are connected by the pins, which are driven through. The pins are surrounded by carbon steel bushings, which take the wear due to meshing with the road track driving wheel. Riveted to the links are the track shoes, which are in contact with the ground. These are pressed from armor plate, and so shaped that they link one over the other. The track shoe is 26½ in. in width. Under normal conditions there is a total of 41.052 sq. ft. of track surface in contact with the ground.

The machine is operated entirely from the driver's seat, located at the forward end of the hull proper. The driver's seat and the forward control unit, including the necessary levers, shafts and linkage, are made up as a single assembly.

The change speed levers for the left and right tracks are similar. The lever is adapted to engage in two quadrant jaws, the outside taking care of the high speed and the inside of the low speed. When the lever is engaged with either jaw and pulled back, the corresponding speed is engaged.

High-Compression Oil Engines

Some New Injection Methods for Heavy-Fuel Engines Described in Paper Read Before S. A. E. Mid-West Section

A COUPLE of new types of fuel injection heavy oil engines were described and compared with the older engines of this type, the Diesel and Hvid, by W. G. Gernandt at the monthly meeting of the Mid-West Section of the Society of Automotive Engineers. Mr. Gernandt summarizes the advantages and disadvantages of the Diesel method of fuel injection as follows:

ADVANTAGES

1—The fuel injection is mechanically timed.
2—The fuel is thoroughly atomized prior to injection.
3—Widely different fuels may be used without alteration.
4—The rate of burning can be controlled mechanically.
5—The two-stroke principle can be used successfully.

DISADVANTAGES

1—Refrigeration during injection.
2—Reduced flexibility.
3—The use of a high pressure fuel pump.
4—The use of an air compressor, coolers and tanks.
5—Troublesome to start.

Similarly he summarizes the advantages and disadvantages of the Hvid method as follows:

ADVANTAGES

1—No working parts for the injection of the fuel.
2—The fuel is thoroughly atomized prior to injection.
3—The fuel is heated prior to injection.
4—Flexibility much greater than Diesel.
5—Easily started.
6—Fuel economy greater than Diesel because of heating of fuel.

DISADVANTAGES

1—The fuel injection is not mechanically timed.
2—Inability to use the two-stroke principle of operation.
3—Necessity of changing fuel cup for widely different fuels.

The two new systems of fuel injection described are the McClintock and the Gernandt.

McClintock Method of Injection

In the McClintock engine the fuel is injected into the combustion chamber by means of compressed air trapped in a separate chamber during compression. The operation of this engine is as follows: When the pressure in the cylinder is the least, or during inspiration, fuel, which is under a slight pressure maintained on the fuel tank by a small air pump, is deposited in a small chamber in direct communication with the combustion chamber through small injection tubes. During the compression stroke the air is compressed into a separate chamber through an automatic valve. As the clearance between the head and the piston is only that necessary for mechanical clearance, practically all of the air in the cylinder is compressed into this chamber.

When the piston starts on its power stroke, the air from the chamber is by-passed into the combustion chamber through a mechanically timed valve and a venturi-shaped port into which project the fuel tubes. Because of the shape of the air port the fuel is drawn from a small chamber and an intimate mixture of air and fuel takes place, with a result that the combustion takes place immediately, and with a close resemblance to the Bunsen burner. The amount of fuel as well as the duration of combustion is controlled mechanically by the load on the engine. With this method of burning, extremely high temperatures result and the materials for the injector and venturi tubes must be carefully selected.

From a standpoint of combustion, this engine possesses the advantage of an intimate mixture between the fuel and the air necessary for combustion. However, as the piston must move on its down stroke a considerable distance before the transfer of air takes place, combustion comes late in the stroke, with a resultant high exhaust pressure and temperature. The engine is, by the way, just as flexible as the majority of automobile engines.

Summarizing the advantages and disadvantages of the McClintock engine, they are as follows:

ADVANTAGES

1—The fuel is thoroughly atomized and mixed with the air.
2—The fuel is heated prior to injection.
3—Flexibility extremely good.
4—The rate of burning can be mechanically controlled.
5—The two-stroke principle can be used successfully.
6—Fuel economy higher than Diesel.
7—Widely different fuels may be used without alteration.

DISADVANTAGES

1—Quite complicated valve mechanism.
2—The fuel injection is not mechanically timed.
3—Somewhat troublesome to start—similar to Diesel.
4—Advantage of high-compression partially lost prior to combustion.

Gernandt Method of Injection

In this engine the fuel is injected into the combustion chamber by super-compressing a portion of the products of combustion which have been trapped at a time when the pressure in the cylinder has attained its maximum. Mechanically, this may be accomplished in various ways, depending upon the general design of the engine, and the trapping chamber may be actually sealed by the use of valves between the super-compressing means and the combustion chamber, or it may be in direct communication with the combustion chamber through the very small injection holes. The injection method is identical in both cases and takes place as follows:

During the suction stroke in a four-cycle, or during simultaneous exhaust and inspiration in a two-cycle engine, fuel is deposited in a small chamber between the combustion chamber and the super-compressing means, either by gravity or under a slight pressure maintained on the fuel in the tank. The fuel is metered and passes through a mechanically timed valve. During the compression stroke the fuel attains temperature and the pressure rises in the fuel chamber. When the piston reaches its upper dead center, the products of combustion, previously trapped, are super-compressed mechanically and forced through the fuel chamber and into the combustion chamber.

Thorough atomization takes place during the injection period. as in the Diesel engine, but in this case the injection gas is highly heated and refrigeration has been practically eliminated, the amount of the products of combustion necessary for injection being so small that the burning effect has not been impaired. Also there is no burning of the fuel until it is actually injected into the combustion chamber. In this engine the fuel, the injection and the rate of injection are mechanically timed, and with an increase in the crankshaft speed there will be a corresponding increase in the rate of fuel injection because the fuel must enter the combustion chamber during a certain angular travel of the crankshaft and not during a certain fixed time. Thus the flexibility of this motor will be very good.

Summarizing the advantages and disadvantages in this method of injection, they are as follows:

ADVANTAGES

1—The fuel injection is mechanically timed.
2—The fuel is heated prior to injection.
3—The fuel is thoroughly atomized prior to and during injection.
4—The rate of burning is mechanically controlled.
5—Widely different fuels may be burned without alteration.
6—The fuel economy is greater than Diesel because of preheating.
7—Greater flexibility.
8—The two-cycle principle can be used.
9—The engine is very easily started.

DISADVANTAGES

1—Addition of super-compressing means, making engine more complicated than the Hvid but much less than the Diesel.

Automobile Performance Analyzed by Mechanical Differentiation

Acceleration, an Important Factor in Automobile Operation, Is Best Determined from Time and Distance Observations by Means of a Mechanical Differentiometer

By Armin Elmendorf, M. Sc.*

IN automobile tests the motor is the usual object of investigation. While considerable valuable data about automobile performance are obtained in motor tests, such tests are cumbersome and yield only a part of the information desired. The purpose of this article is to show how much more complete information may be secured from a single curve which is obtained with less preparation than that required for an engine brake test. The curve referred to is the velocity-time curve of an automobile which is first accelerated under the best running conditions from its minimum speed to nearly its maximum speed and then allowed to coast by cutting off the ignition. With no other data than this curve and the weight of the machine with its occupants, it is possible to obtain the following information about automobile performance:

(a) The grade the car can "make" at various speeds.
(b) Total power losses, which include that due to wind resistance, friction in the machine and losses at the tread of the tires.
(c) The horsepower required to drive the car at any constant speed.
(d) The excess power available at any speed beyond that needed to keep the car going at that speed.
(e) The indicated or cylinder power of the engine at any speed.
(f) The efficiency of the automobile as a machine at any speed.

Theory and Definition of Terms

Average and Instantaneous Acceleration—Fig. 1 shows an actual experimental velocity-time curve for a 6-cylinder car running in low gear. It is desired to know what its acceleration is at the end of three seconds. By the usual definition of the term, acceleration is the time-rate of change of velocity. If then we subtract the velocity of the automobile at the end of three seconds from its velocity at the end of five seconds we have the change of velocity that took place during two seconds and may obtain the average acceleration during this period by dividing the difference in velocity by 2. The difference in velocity is given in the diagram by the distance B′C′. This distance divided by AC′ is the average acceleration for the period under consideration. It will be observed that the average acceleration is given by the slope of chord connecting two points on the curve. Similarly, the average acceleration for the second following the third is given by the slope of AB″, and for the one-half second following the third second by the slope of AB‴. Decreasing the time interval in this way shortens the chord and gradually changes its direction until the limiting case is reached where the time interval is indefinitely small and the chord has the direction of the tangent and the average acceleration becomes the *instantaneous* acceleration. Thus the instantaneous acceleration of the car under consideration at the end of the third second is given by the slope of the tangent AC drawn at A. If the magnitude of this slope is plotted for each point as an ordinate from a convenient axis we obtain the instantaneous acceleration curve, usually called simply the acceleration curve. This curve is shown by M N O in Fig. 1.

In the terminology of calculus, the acceleration curve is the first derivative curve of the velocity curve, and acceleration is the derivative dv/dt where v is velocity and t is time.

Traction Effort—By carrying out the division mentioned, it will be seen that the acceleration of the car when t = 3 sec. is 4.4 ft. per sec.^{2} The question arises, how much force would a second car pulling this one have to apply to impart to it this acceleration, assuming that the car pulled is absolutely frictionless? Applying this elementary relation between force, mass, and acceleration, we obtain for this car, which weighed 3225 pounds with its occupants,

$$F = \frac{3225}{32.2} \times 4.4 = 440 \text{ pounds.}$$

A force of 440 pounds applied to an actual car would, however, not impart this acceleration, because friction must also be overcome. If we denote the pull which is

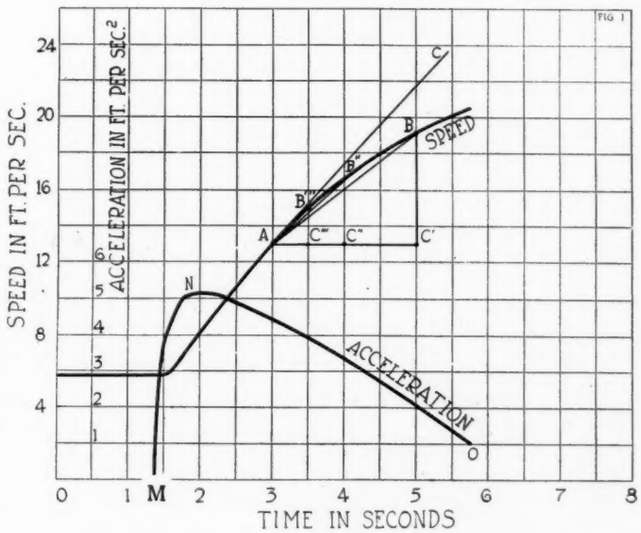


Fig. 1—Speed-time and acceleration-time curves of 6-cylinder car

*Madison, Wis.

just large enough to keep the car going at constant speed by R, we see that the total force required to impart the desired motion to the car is the sum of F and R. This force we will denote by the term, traction effort. It is obvious that when the car is proceeding at a constant speed the traction effort to pull it is equal to its total resistance.

Traction Power and Indicated or Cylinder Power—The power expended by one car in pulling a second we will call "traction power." Let us forget for the moment the usual power formulas and go back to the more fundamental definition of power as the rate of doing work. Assuming that a force of 100 lb. will keep the car going at a constant speed of 13 ft. per second, we have a total force of 540 lb. acting on the car, which is moving at the instantaneous speed of 13 ft. per second and being accelerated at that instant at the rate of 4.4 ft. per sec.^{2}, we see that work is being done at the rate of

$$540 \times 13 = 7020 \text{ foot-pounds per second.}$$

Dividing by 550, the horsepower constant, we obtain as the horsepower expended in imparting an acceleration of 4.4 ft. per second^2 to the car and overcoming its total friction, the value of $7020/550 = 12.8$ hp.

We will suppose that the clutch had been left in so that the pistons were in motion while the car was being pulled along, introducing the friction of all moving parts. This, added to the wind resistance, is the total friction which necessitated the pull of 100 lb. in the present problem. Now, if the rope pulling the car were suddenly cut and the spark thrown in so that the car propelled itself and imparted to itself, through the force at the rims of the wheels, the same acceleration, it is seen that the cylinders must do just as much work per second as the first car did in pulling this one. In other words, the cylinder or indicated power of the second car is equal to the traction power of the first.

This equality between traction power and indicated power is in reality only approximate. Two slight errors are introduced, one of which cannot be corrected and is probably quite insignificant, and the other may be corrected but not without considerable labor. The first error arises from assuming the friction losses in the mechanism when the engine is running under compression equal to the friction losses when the charge is exploded.

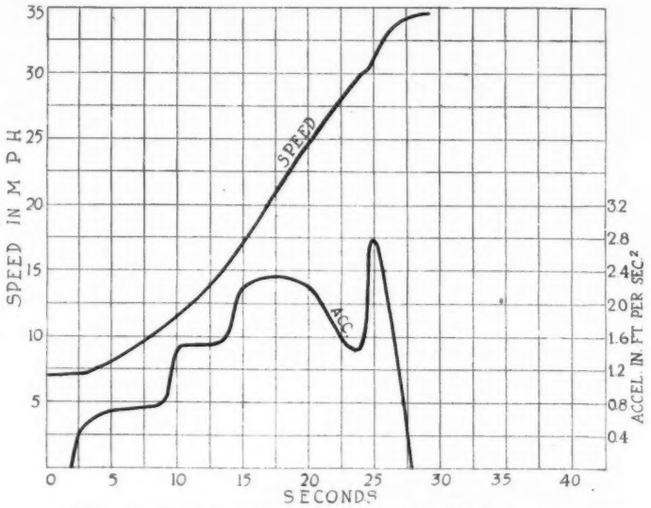


Fig. 4—Performance curves of 4-cylinder car in high gear

The second error arises in neglecting the power required to give all rotating parts an angular acceleration. Using the following notation we may correct for this after determining the angular acceleration of the major rotating parts corresponding to each value of the linear acceleration of the car as a whole, and the moment of inertia of the rotating part about its axis of rotation. Let

I = the moment of inertia about the axis of rotation.
α = the angular acceleration.
ω = the angular velocity corresponding to α.

Then at any instant the total torque required to impart angular acceleration to all the rotating parts is given by $\Sigma I\alpha$, where both I and α may be different for each part and the horsepower consumed in imparting angular acceleration is $\Sigma I\alpha\omega/550$, where I is in slung-ft.^{2}, α is in radians per sec.^{2}, and ω is in radians per second.

The main rotating masses are, of course, the wheels and the engine flywheel, for which the moments of inertia may be readily obtained experimentally.

Automobile Efficiency.—It is desirable that power losses due to friction and wind resistance be as low as possible. The lower the friction losses, the greater the ratio of the power available to accelerate the car to the total or indicated power. The latter ratio expressed in percentage we will denote by *automobile efficiency.*

Hill Climbing Ability—In order to keep a car going up a grade at a constand speed it is necessary

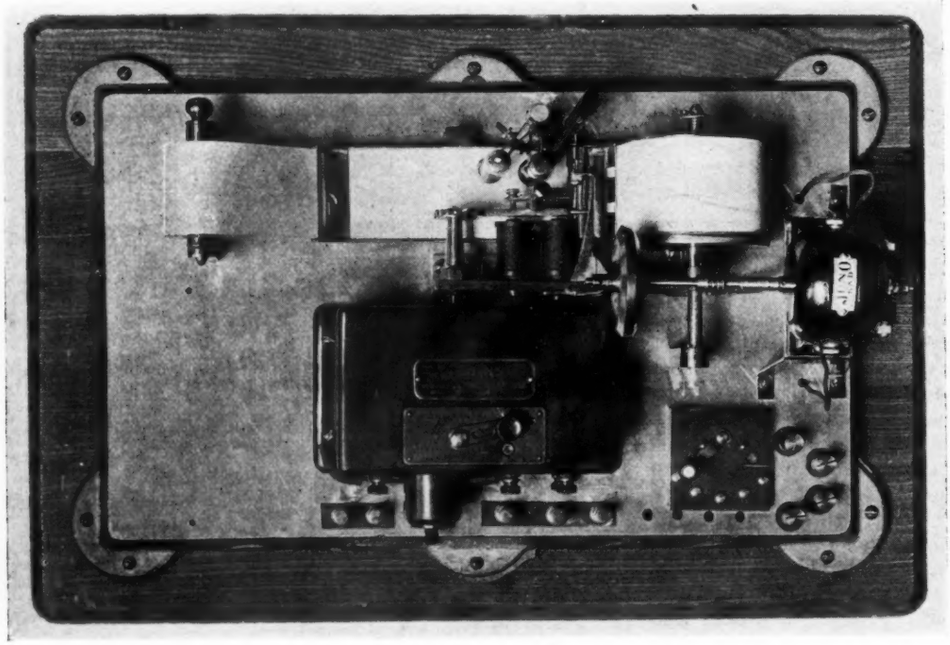


Fig. 2—Instrument for obtaining a graphical record of automobile speed

that the force driving it forward be equal to the component of its weight acting down the incline. Or, if the acceleration of gravity be resolved into two components, one acting down the incline, and the other normal to the incline, it is obvious that the engine must be able to impart an acceleration to the car on a level equal to the former component in order that the car may proceed up the given grade at a constant speed. Thus, in order to climb a 20 per cent grade the car must be able to attain an acceleration of 6.4 feet per sec.[2]*

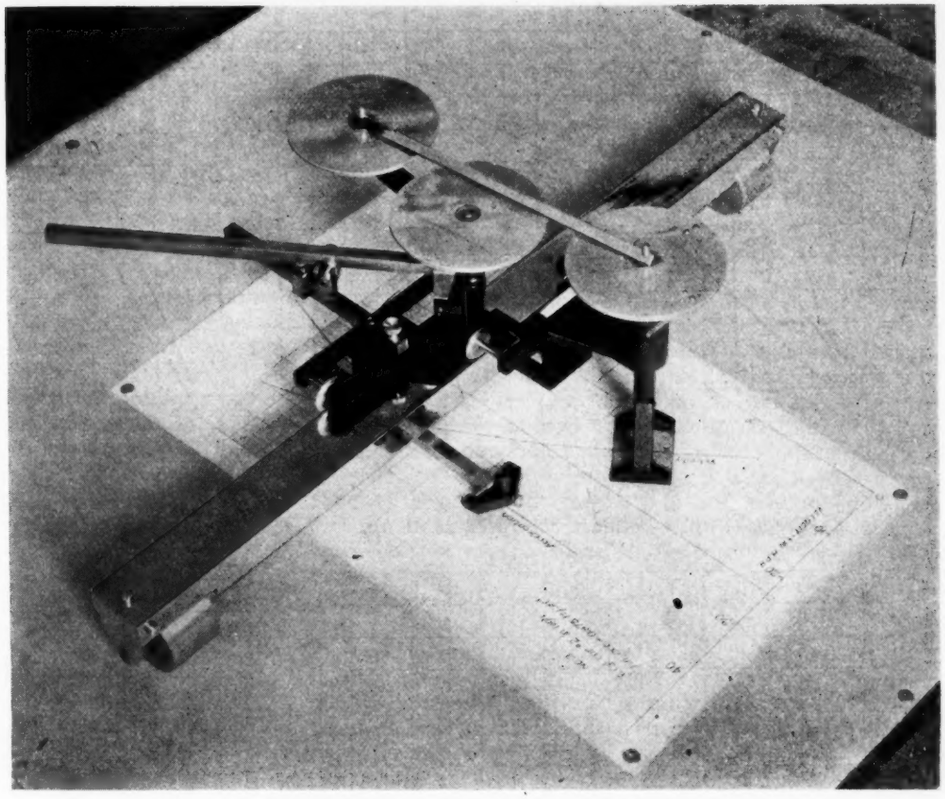


Fig. 3—The author's differentiating machine

The velocity data from which all speed-time curves were plotted were obtained by Messrs. Barker and Safford and presented to the faculty of Worcester Polytechnic Institute in a thesis for an engineering degree in June, 1917. The tests were made on the straight-away of the Narragansett Speedway. In starting to accelerate the car under test the driver used his discretion about the best throttle position. Acceleration runs were made usually by starting very near the minimum car speed and proceeding to nearly the maximum speed for the gear ratio used.

Tests were made on two six-cylinder cars, an eight-cylinder, a twelve-cylinder, and a four-cylinder car, each of which was given one or more trials when running in low gear, high gear, and intermediate gear. A coasting run was made on the eight-cylinder car and a brake test was made on the four-cylinder car, which was equipped with a vacuum brake.

The apparatus used for getting the speed-time record is described in the June, 1917, Report of the Research Division of the Standards Committee of the S. A. E., which report may be referred to for more details. In its essentials it consists of a mechanism for winding a broad paper ribbon which receives perforations from electric sparks sent across a gap each time contact is made by a make-and-break device attached to the wheel steering arm of one of the front wheels. A magnet actuated by current from a timing device indicates periods of one second upon the ribbon by notching the line made by a

*Here again, as was observed in the previous footnote, an error is made, so that the method is only approximately true.

The power which is consumed in imparting angular acceleration to the rotating parts when the car is running on a level becomes available to climb the grade if the car goes uphill at a constant speed, so that the grade established by computations from the observed linear acceleration of the car on a level is slightly low.

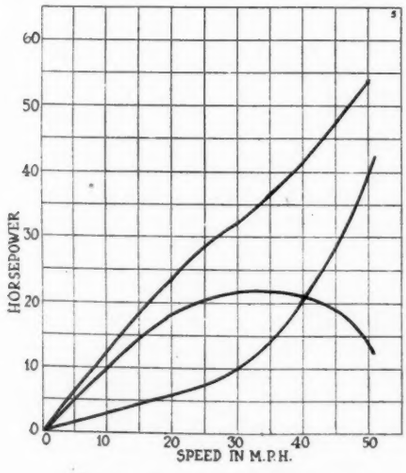


Fig. 5—I. H. P. 8-cylinder car in high gear (rated hp., 31)

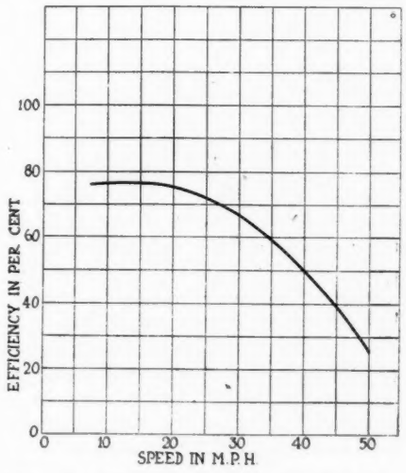


Fig. 6—Automobile efficiency, 8-cylinder car in high gear

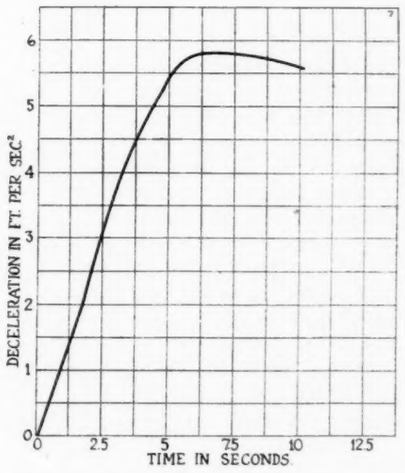


Fig. 7—Vacuum-brake test, 37 m.p.h. when applied; 8 m.p.h. after 10 sec.

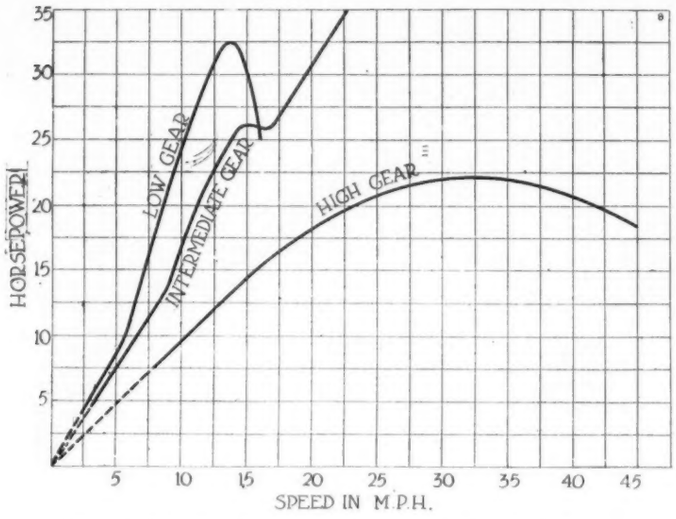


Fig. 8—Traction hp., 8-cylinder car rated at 31 hp.

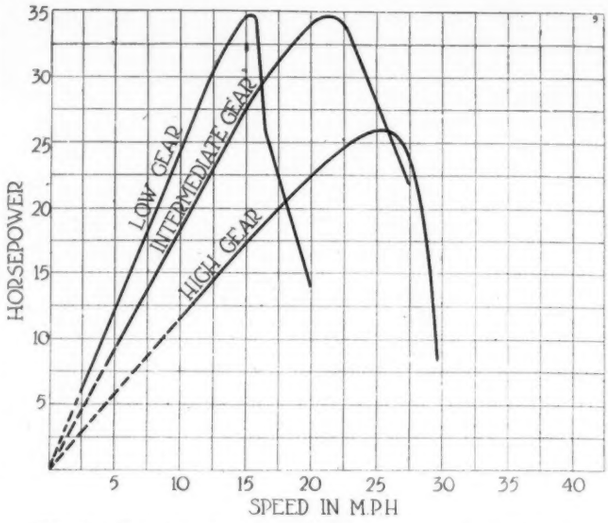


Fig. 9—Traction hp., 12-cylinder car rated at 36 hp.

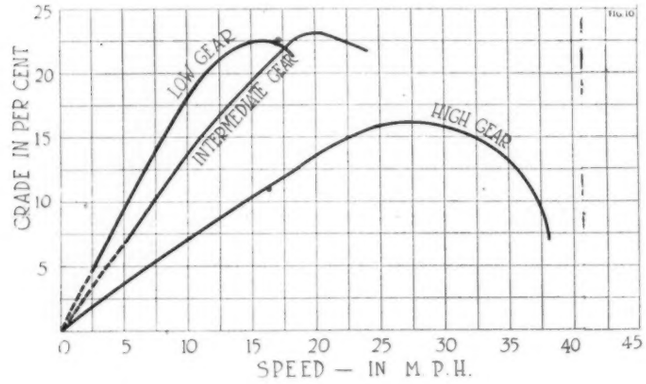


Fig. 10—Traction hp., 6-cylinder car No. 2, rated at 29.4 hp.

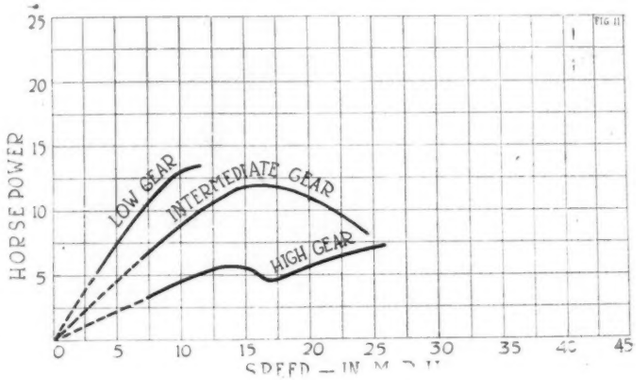


Fig. 11—Traction hp. of 6-cylinder car No. 1, rated at 31.5 hp.

pen. The number of sparks between second gaps represents the distance the car has traveled in a second, that is, the average speed for the second. The difference in the number of sparks represents the difference in average speeds between seconds, hence the average acceleration for a second. It is only necessary to determine by measurement the distance the car travels for each spark and the record may be calibrated to read in feet.

By plotting the speed-time data a curve is obtained that lends itself well to mechanical differentiation. A top view of the instrument is shown in Fig. 2.

Differentiation of the speed-time curve gives the acceleration-time curve as previously explained, in which every ordinate represents the instantaneous acceleration at a given instant. The author's differentiating machine with which the acceleration-time curves were developed is shown in Fig. 3. It is simply a device for giving a graphical record of the rate dv/dt, or slope at any point of the speed-time curve. Two hair lines crossing each other at right angles are ruled upon a transparent plate and serve to get the direction of the tangent at any point on the given curve. The slope of the curve at this point is plotted as an ordinate by the pen shown in Fig. 3 as resting upon the acceleration curve. A number of points are obtained in this way, and a smooth line is drawn through them by hand giving the desired acceleration-time curve. Except for steep slopes it can be depended upon to give results accurate to 1 per cent.*

(a) *Detecting Irregularities in Engine Performance*—Assuming that the driver operated the car to best advantage in this run, as far as he could judge, such curves as those shown in Fig. 4 would indicate poor performance, inasmuch as maximum acceleration is not reached until several seconds have elapsed after starting, and the acceleration is very non-uniform in that it fluctuates considerably in magnitude.

(b) *Traction, Friction, and Indicated Horsepower*—In Fig. 5 the curve of traction horsepower was obtained, as previously explained, by multiplying the mass of the car by the acceleration and velocity at any instant. The friction horsepower was obtained similarly by multiplying the mass by the deceleration at any instant and the velocity at that instant. The power obtained in this way was plotted against the speed. The sum of the total friction power and the traction power, as previously shown, gives the total power of the engine; that is, the indicated power. It is interesting to note how nearly straight the indicated horsepower curve is, showing that the indicated power of the engine, for this car at least, is practically proportional to the speed; and, further, that at the maximum speed attained the indicated power is almost double the rated engine power. The rapid increase with speed of the friction horsepower after a speed of 30 m.p.h. has been attained is also of interest in that it tends to show that the power lost due to air resistance increases more rapidly than does the speed

*For a description of the general subject of mechanical differentiation and a description of an earlier model of the instrument, the author's papers in the Journal of the Franklin Institute for January and February, 1918, may be referred to.

beyond 30 m.p.h. The power available for traction remains practically constant between 20 m.p.h. and 40 m.p.h., reaching its maximum at about 30 m.p.h.

One of the most valuable of curves to show automobile performance is the curve showing the power required to drive a car without acceleration, that is at any constant speed. The friction-power curve is exactly such a curve, for it shows how much power the engine must deliver at any speed to overcome all friction; that is, to propel the car at a constant speed. Variations in body design may, for example, affect the friction power considerably at high speeds. Differences in power losses in the tires may possibly be detected by varying the air pressure or by changing the tires.

(c) *Automobile Efficiency*—The proportion of the total power in the cylinder available for traction falls from about 80 per cent at 15 m.p.h. to about 30 per cent at 50 m.p.h., as shown in Fig. 6.

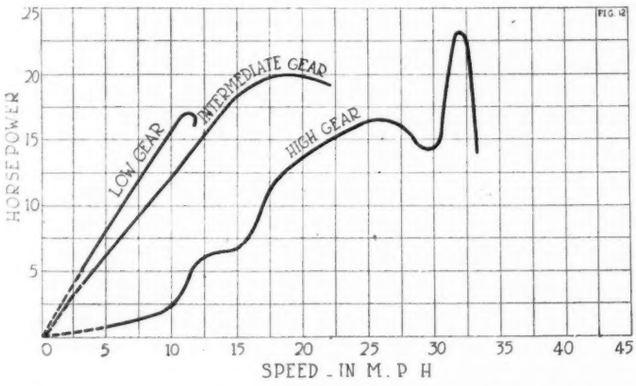


Fig. 12—Traction hp. of 4-cylinder car rated at 19.6 hp.

(d) *Brake Performance*—Fig. 7 shows that in this particular brake test the maximum deceleration was not reached until six seconds had elapsed from the time the brakes were first applied; that is, the retarding force was gradually increased, thereby eliminating the undesirable jar resulting from a sudden gripping of the brakes. The maximum deceleration was no higher than the *acceleration* of several cars when the throttle is opened wide and the gears are in low.

(e) *Traction Horsepower*—Figs. 8 to 12 show the differences in traction horsepower of various cars when running in high, low, and intermediate gears. In general, the maximum traction horsepower attainable is obtained by driving the car in intermediate gear. The low-gear maximum is attained at a slower car speed than the former and at a higher speed than that for the maximum traction horsepower when running in high gear. Fig. 8 shows a peculiarity in that the power curves for the low and intermediate gears are not directed toward the intersection of the co-ordinate axes over a large section of the curve. Fig. 9 shows the traction power curves for a 12-cylinder car. The proportionality of traction power to the speed is clearly brought out. It is interesting to note that at any given speed, within limits, the traction horsepower in low gear is double that in high gear. In Fig. 10 the curves for the 6-cylinder car No. 2 show a value somewhat greater than 2 for the ratio of low gear to high gear traction horsepower at any given speed, within limits.

Fig. 11 shows very poor performance, in that the traction horsepower with any gear ratio is very much below the rated horsepower of the engine. A closer study of power losses in this car should have been very profitable.

The irregularities in the curve for traction power in high gear for the 4-cylinder car are due to fluctuations

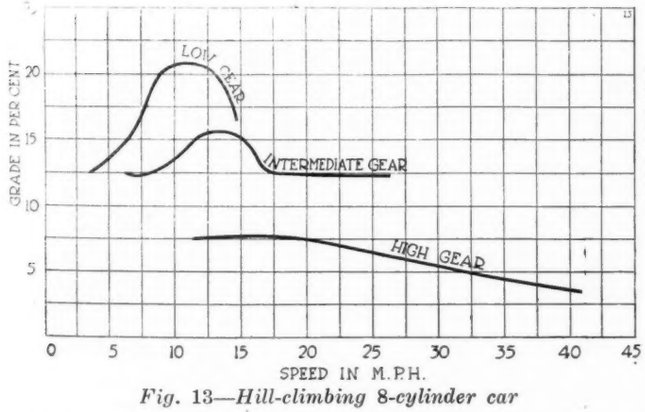


Fig. 13—Hill-climbing 8-cylinder car

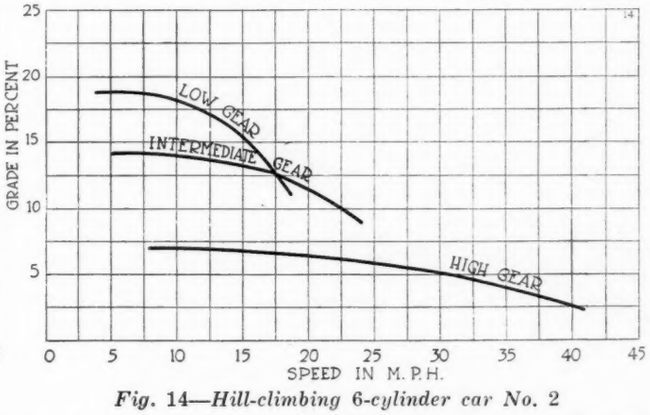


Fig. 14—Hill-climbing 6-cylinder car No. 2

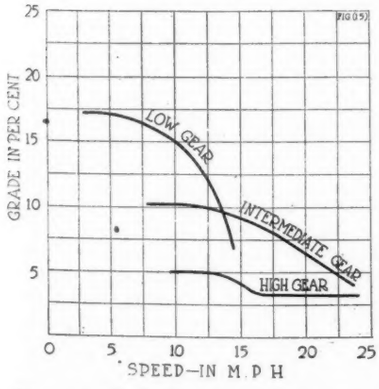


Fig. 15—Hill-climbing 6-cylinder car No. 1

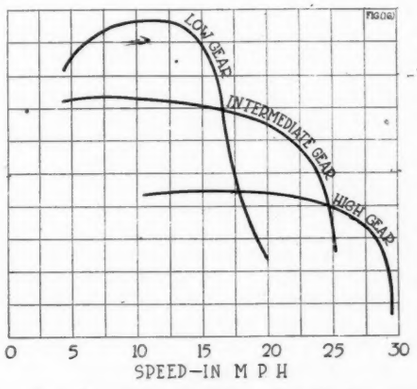


Fig. 16—Hill-climbing 12-cylinder car

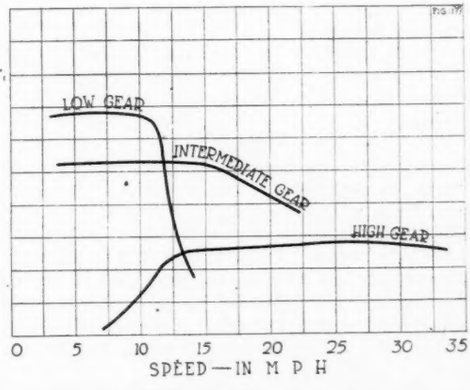


Fig. 17—Hill-climbing 4-cylinder car

in the acceleration brought out in Fig. 4. The traction power slightly exceeded the rated engine power for both the intermediate gear and the high gear runs.

(f) *Hill Climbing*—Fig. 13 shows that the 8-cylinder car can climb a grade of 21 per cent at a constant speed of 11 miles per hour. The curve is rather peculiar in that the maximum grade-climbing capacity is not attained until this speed is reached. The great reduction in ability to climb hills when running on high gear is very marked. The curves of Figs. 14 and 15 for the 6-cylinder cars are different from the curves for the 8-cylinder car in that they have maxima at the speeds at which the tests were begun. The curve for the run of the 12-cylinder car in low gear in Fig. 16 shows the highest grade-climbing capacity of all cars tested, in that this car can make a 24 per cent grade at a constant speed of 14 m.p.h. Fig. 17 shows the curve for the 4-cylinder car. The high-gear curve is only approximate, but the low-gear curves are quite accurate, and show a constant grade-climbing ability over a considerable range of speed.

The author believes that the data obtained with the apparatus the Research Division developed for recording the speed of a car under acceleration or deceleration, when operated upon with a differentiating machine, yield information that should be of value in improving car design. The power rather than the acceleration curves should be used to study car performance, because power measures energy consumption, while acceleration in itself does not. Energy consumption is identical with fuel consumption, and involves economy, while acceleration merely illustrates the behavior of the car from the point of view of kinematics, which is of more interest to the mathematician than to the engineer and car user.

Meso-Thorium as an Ingredient of Luminous Paint

THE increasing demand for radium for medical work, but more particularly for luminous paint, has made the question of possible radium substitutes of considerable importance. Radium luminous paint has been used in the war for a number of purposes, more particularly on the dials of instruments used on airplanes, so that these instruments can be read at night; for electric push buttons, door numbers and small images for shrines, etc. The paint is permanently luminous in the dark and contains from 0.1 to 0.25 milligrams radium element to one gram of zinc sulphide. A luminous watch face usually has from ten cents to twenty cents of radium on it.

An excellent substitute for radium for certain purposes is meso-thorium. This is a radio-active element found in monazite sand and other thorium minerals. When first extracted it is not in a satisfactory condition for luminous paint, but must be allowed to "ripen" for several months or even a year before it can be used. During this time the alpha radiation which is required for luminous paint becomes sufficiently strong. On the other hand the beta and gamma radiation of meso-thorium grows rapidly and it can be used for medical purposes within a few days after preparation.

Radium has a long life, half of it decaying in approximately 1600 years. Meso-thorium on the other hand has a short life, 5 or 6 years being its useful life for luminous paint purposes. The price in the past has varied from 40 to 60 per cent of that of radium, the comparison being on products of equal activity. For medical purposes therefore it cannot compete with radium as long as there is plenty of the latter; for luminous paint, to be used on objects which themselves have a short life, it is an excellent substitute for radium and will tend toward the saving of radium for medical purposes.

It undoubtedly has been used during the war especially by the Germans. Some of the first luminous watch dials in this country probably contained meso-thorium imported from Europe.

Until recently no meso-thorium was recovered in the United States, although large quantities of monazite sand are annually treated for the manufacture of incandescent gas mantels. Such a condition has represented an important mineral waste.

Shortly after the United States entered the war the Bureau of Mines made a co-operative agreement with the Welsbach Co. of Gloucester, N. J., for the study of methods of extraction and recovery of meso-thorium. The work was carried on at the Rocky Mountain station of the Bureau of Mines at Golden, Col., under the direction of Dr. R. B. Moore, superintendent of the station, Dr. Herman Schlundt being assigned to the detailed work on the problem. Successful methods of extraction and recovery have been worked out and connected up with the regular metallurgical processes of the Welsbach company. Meso-thorium is now one of the regular products made by this company. The next largest producers of thorium salts in the country about the same time became interested in the recovery of meso-thorium and worked out its own methods. Consequently at the present time meso-thorium is recovered from practically all the monazite sand treated in the United States.

The details of the work of the Bureau of Mines will be published later. A preliminary announcement was made by Dr. Moore in a paper given at the September meeting of the American Institute of Mining Engineers at Colorado Springs. Incorrect press reports of this announcement gave rise to some serious misstatements of facts, hence this statement.

The Bureau of Mines has never claimed the discovery of meso-thorium, as this element was first identified and described by Hahn in 1905.

Transatlantic Airplanes

NOW that the war is over and aircraft manufacturers are confronted with the problem of finding new outlets for their production we may soon see serious attempts made to cross the Atlantic Ocean. The cash prize offer of the London *Times* for the achievement, which was withdrawn during the war, has been restored, and work on machines which are to try the flight is reported from different centers. Thus our own Naval Aircraft Factory in Philadelphia is reported to be working on a flying boat for the purpose. The Grahame-White Co. of England is advertising for the services of an experienced navigator who is also a pilot to undertake the journey on a machine now being built. At the Farman works in Boulogne-sur-Seine a giant commercial type of airplane, referred to as the Goliath, has recently been completed. It is said to be capable of the Atlantic voyage when fitted with floats. It is capable of carrying 20 passengers, making 100 miles per hour and to travel 1900 miles on one supply of fuel.

We are informed that at the Bleriot works two new large four-engined aeroplanes are nearing completion, which will, it is expected, be suitable for aerial transport in the colonies, where roads are none too good and railways non-existent. In such cases the aeroplane will link up by postal air service one colony with another, and with the capital, while numerous other spheres will doubtless be found, in which the large weight-carrying aeroplane will be of inestimable service.

What Should Organization Achieve?

It Should—

1—Pr vide Incentive to Work
2—Settle Individual Grievances
3—Settle General Disagreements
4—Improve the Working Force
5—Decrease Labor Turnover
6—Reduce Friction Between Departments

By Harry Tipper

SOME time ago the various branches of one of the important industries in this country were involved in continual disputes and in a form of competition which was very destructive in its character.

It occurred to a few of the leaders in this industry that a co-operative organization, formed of the various branches by the election of a few delegates from each branch, would provide machinery by which these disputes would be ironed out and action taken.

The organization was formed. In its character and constitution it was not binding upon any of the branches, or their individual concerns, to agree to any of the decisions made.

When it had been operating for about three years, an examination of its files showed that only three cases had been brought to it which had required regular record decision and promulgation of the decision. The disputes and disagreements, which had filled the air so much before the organization was formed, had vanished without the registering of any complaint when the machinery had been running for a little time.

Some of the members were inclined to question the value of this organization because it did not appear to be doing much work. The fact was, its greatest work had been accomplished in providing a common meeting place with regularly scheduled occasions for meeting at which the disputes of the various branches of the business had died away in a measure of understanding.

These meetings are still being held regularly, although they do not take up very much time, because it is generally understood by the individual concerns in the industry that the better understanding which prevails between the different branches is due to this co-operative organization and it must be maintained by the same means.

Number of Cases No Criterion

In considering the success of co-operative industrial organization, created within the industrial unit for the purpose of settling the matters of disagreement, it is obvious that the number of cases which have been settled is no criterion as to the value of the work and in some of those organizations, where the machinery for the settlement of these matters has been in existence for the longest period of time, the number of cases called to the attention of the organization becomes smaller each year.

What, then, should come out of the efforts of such an organization in order to justify it industrially, after it has been working three or four years?

It is obvious that it should provide a greater incentive to work and to remain at work in the same establishment.

It should show evidence of having settled individual grievances and reduced the number of those grievances.

It should show evidence of having settled general disagreement upon wages and hours, and having reduced the number of such disagreements, or, at least, settled them amicably without the interruption of production or the formation of strikes.

It should also show evidences of providing permanent machinery for the improvement of the working force, for important matters of welfare and for the development of other activities for the mutual benefit of the concern and its employees. This evidence would accumulate in the form of a decrease in the turnover of the labor, this showing gradually in the operation from year to year; a decrease in the friction between departments and employees, as evidenced by the reduction in the number of cases of personal grievances; an adjustment of the wage question by amicable arrangement, and the operation of the welfare department by the employees themselves in just and proper relation to the concern's necessities.

Of the several concerns whose co-operative organizations have been established along the lines outlined in the last article, some of these have been operating for a sufficient length of time to make it possible to examine the records and determine the relation which they bear, in their industrial results, to the former condition.

The Effect Upon Turnover

In one of these organizations, where the experiment has been tried for four years, the turnover has been reduced so that instead of 40 per cent of the number of employees having a record of more than six months continuous work 80 per cent of the employees now qualify under that requirement. This has meant a very large reduction in the turnover and a very great increase in the stability of the organization.

It has, of course, shown itself also in the marked difference in the spirit of the various departments where the stability of labor has introduced a co-operative spirit greatly to the benefit of the productive capacity of each department. This important factor is again increased in its value when examination is made of the action taken by the organization upon the question of wages in general and upon the question of individual increases.

The Adjustment of Personal Grievances

The record of the adjustment of personal grievances is not in such shape that it can be determined with accuracy from the statistics. A careful examination of the matter indicates that these personal grievances have decreased to such an extent that the Betterment Committee, or the Board of Review, by whichever name it happens to be called, is rarely required to enter into this question at the present time.

It is indicated from the conversation of the heads of departments and the officers of the company that the personal grievances are more freely discussed between the employee of a department and the supervisor and settled more largely in that amicable way, without being brought to the organization machinery for decision.

It is perhaps principally in the matter of discharges that the greatest progress has been made. As stated in the last article, there are certain causes for which an immediate discharge without the right of review is retained, and the experience is that the discharges from these causes have decreased very greatly since the establishment of the judicial machinery, so that they are now very infrequent.

It has been noted, further, that the establishment of the committee empowered to review the discharge of any person, not guilty of one of the offences stated above, has had the effect of eliminating the discharges for trivial causes, which, while infrequent, were unnecessary.

It has also improved the morale in each department by the feeling of confidence engendered by the knowledge that the employee has the right of review and the fair and careful investigation which has preceded the decision in each case. While the statistics are not available, it is gathered from conversation with various department heads that the reduction in discharges of this kind amounts to a little more than 60 per cent of the total number over a given period.

Wage Adjustments

It is in the matter of wage decisions, perhaps, that this type of organization receives its greatest justification in those individual industrial units where it has been tried out. In four years, in one unit, eight decisions have been made upon the wage question without involving a strike, without interrupting the orderly process of production and without the turmoil and lack of confidence which usually arise in such cases.

It is to be noted that, in this number of cases, there were three decisions affecting wages and raises in the first year, two decisions in the second year and one decision in the third year, which finally led to the establishment of a permanent committee to deal with that question exclusively and the establishment of a basis which automatically settled the general system upon which wage increases would be allotted.

Any one of these decisions would have been sufficient to cause a strike in many plants, or greatly reduce the productive efficiency, create dissatisfaction among the workers and increase the turnover and the loss of production.

It should be remembered, in considering these decisions, that they were made by the full discussion of the combined representatives of the general employees and the representative department heads and supervisors, so that they were the result of a full and free discussion between the parties at interest who were familiar with all the details of the case.

To the writer the most remarkable thing is the fairness exhibited by the records of the discussions and the resolutions passed, and the fact that such discussions have gone much further, in actual understanding of the employer's position by the employee, and vice versa, than any of the discussions which have occurred and been brought to his attention between the general organized labor groups and the groups of manufacturers.

The operation seems to have worked out in this general way: The employees who felt that they were entitled to an increase in wages, change in the hours, extra holidays, or something of that kind, presented the matter to their representative. The representative, better informed as to conditions on account of his contact with such questions through his participation in the discussions of the house, would be able to secure a modification of these demands before the final instructions were given to him to be presented to the house of representatives.

When such instructions were taken upon the floor of the house of representatives, all other departments would be able to further modify the demands in their full discussion of the matter from all points of view.

The presentation of the matter to the senate would then result in further modifications unless the matter was already cleared, so that when the matter was finally presented to the company the proposition represented a fair basis for action.

It is in this respect indeed that the organization has justified itself more strongly than in any other respect and that the use of the supervisors and heads of departments, as a second body, has been justified more thoroughly.

The general executives could not inform themselves readily upon the total advantage and disadvantage of any course of action, and matters could not be brought out so freely in discussion before a decision was to be made.

By the interposition of the body of department heads, the total disadvantage and advantage in operation have been thoroughly threshed out and the matter brought into some general co-ordination with the development and interests of the business before being passed up to the heads of the firm for final action.

The records show that the employees have secured wage increases a number of times in common with all other employees. They also show, however, that they have agreed to take care of wage increases on a more permanent basis and upon better grounds than the average industrial organization. They have created permanent machinery to deal with the question which will give them an opportunity to improve and develop the matter upon the basic principles already admitted in these dealings between the workers and the individuals of the same industrial unit.

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Information. By Harvey E. Phillips. Auto Electric Systems Publishing Co., Dayton, Ohio. Price $2.50.

This is a volume of some 400 pages, containing very elaborate information on elementary electricity, motor car electric systems, the gas engine from an ignition point of view, and driving the car. Mr. Phillips has had extensive experience with the Bell Telephone Co., the Dayton Engineering Laboratories Co., and has been consulting engineer to Aviation Mechanics Training School. He has also published a number of smaller booklets on electrical subjects, especially pertaining to automobile ignition.

In the present book not only are the elementary principles of electricity taken up and thoroughly explained, but the different systems are gone into in detail and there is a considerable amount of information given on driving the car correctly. In the next part of the book are published a considerable number of wiring diagrams of starting, lighting and ignition systems on automobiles up to and including 1917 models.

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AT the annual meeting of the German Association of Gas and Water Engineers, which was held in Berlin recently, the question of the continued demand for coal gas for road vehicles after the war was discussed. The belief in a future increasing demand is based chiefly on the shortage of horses. There are, however, also, other advantages connected with the use of gas. Experience in Berlin with a 3-ton motor truck shows that the consumption of gas is about one cubic meter per kilometer, or 60 cu. ft. per mile of travel.

Left-Side Drive for Export Cars

Difficulties Involved in Building One Model in Both Right and Left Hand Drive Types—The Left-Hand Drive Has the Same Advantages in Most Foreign Countries as Here—Action by N. A. C. C. Suggested

By A. C. Woodbury

ONE of the serious difficulties connected with export business as conducted by the average American automobile builder during the past few years has been the demand for right-hand drive in most of the world outside America. Catering to this demand is the cause of much expense and inconvenience throughout the whole history of a model.

When the design is first laid out on the drafting board it is necessary to provide clearance for the steering gear on both sides of the engine, often either causing the shifting of engine accessories from one side to the other, or preventing the best arrangement that would be possible if the position of the steering gear were fixed. Many times resort is had to expedients on control rods, brake connections and exhaust pipes for right drive models that would not add luster to the reputation of the engineering department were the stripped chassis exhibited to the critical gaze of a National show. From the inception of the design to the time when the last "right drive only" part is sold for service the production of right drive cars concurrently with left drive cars is a source of bother, errors and expense. With the market of the world in its present state it is worth while now to consider whether the demand for right drive cars has really any basic foundation which must be respected, or whether it is one of those bugbears for which we have entertained a groundless fear.

The prevalence of right drive in foreign countries is often ascribed to the different rule of the road requiring meeting cars to turn to the left instead of to the right and causing all vehicles to keep to the left side of the road. That this is not a really serious reason is seen from the fact that for years almost every car built and sold in this country with its turn-to-the-right rule had right-hand drive. Also several instances are on record of models brought out with left drive, later to be changed to right drive because the public demanded the arrangement to which it was accustomed. In France, where the rule of the road is the same as our own, the right drive still prevails.

Advantages Claimed for Left-Hand Drive

It is true that many drivers will tell you that the left drive is the best because they can see best from the left position how close to drive to a car they are meeting, but it is equally true that the right position enables them to better judge the distance to the edge of the finished surface of the road and the clearance from cars or teams they are passing, while there is also a little gain in getting sooner out of the dangerous zone in meeting a glaring headlight. None of these arguments are the determining ones. To find the real reason for the change from right to left drive in this country we will recall a little history.

Eight or nine years ago nearly all cars had right drive, and the front compartments were not enclosed by doors. At about this time the "fore door" body made its appearance, after being introduced by early attempts at stream line or "gun boat" bodies. Up to this time the right side of the driver's seat was usually quite inaccessible. The brake lever, gear shift lever and steering wheel were too much in the way to permit easy ingress or egress, and spare tires usually completed the enclosure. So there was no compunction against providing only one real door in the front compartment and closing the right side by a panel.

However there was real difficulty in arranging the control levers so they were accessible and sightly without encroaching on the position of the driver. Some designers put both levers outside where they were both inconvenient and unsightly, others placed them inside, resulting either in cramping the position of the driver or making an unsightly bulge in the body, while still others compromised by putting one lever inside and the other outside. This compromise was even worse than the others as to knuckle clearance. One maker went so far as to enclose the gear shift lever in the body panel with an elongated gear shift gate in place of the molding at the top.

Control Levers Moved to Center

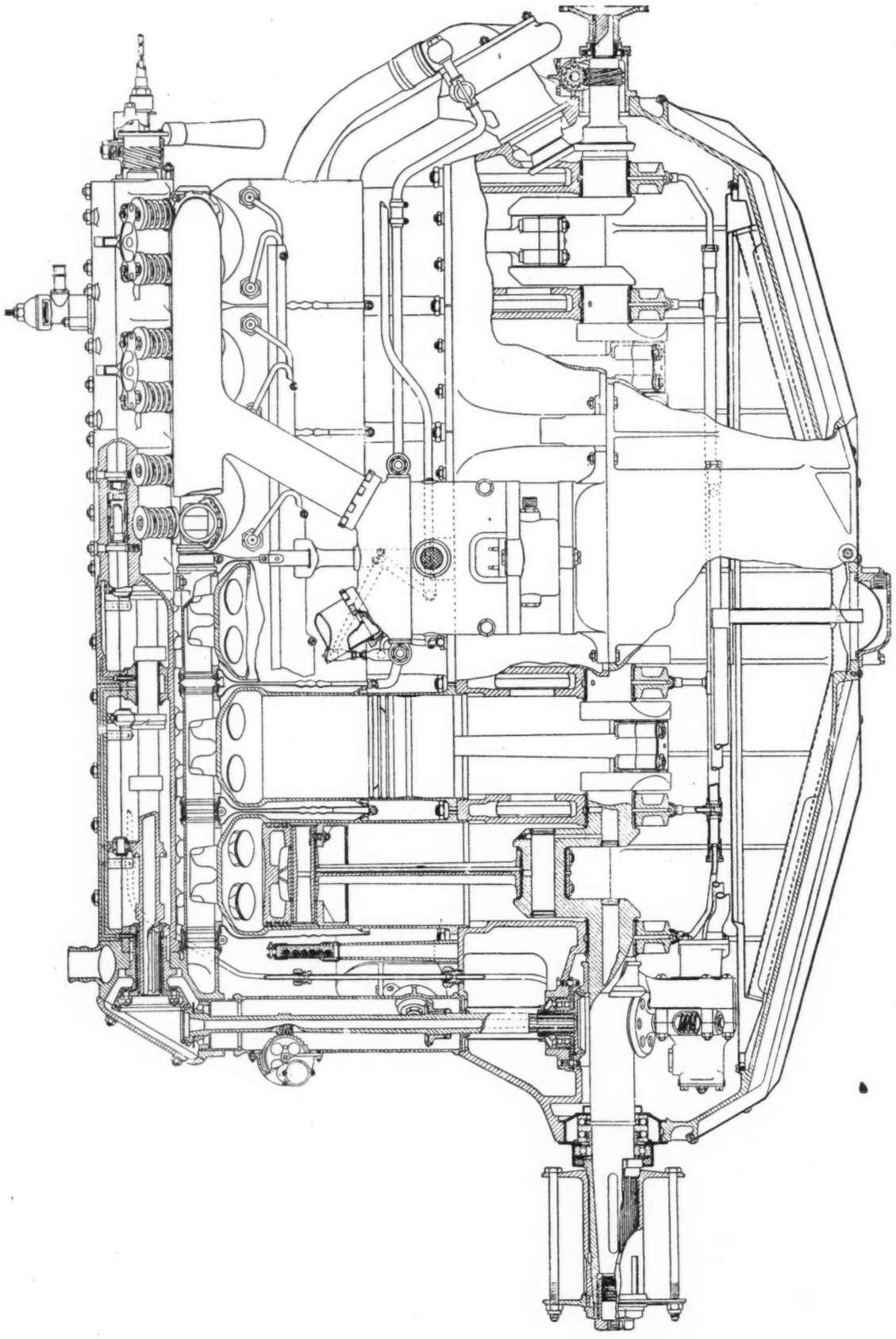
Next, one or two manufacturers hit upon the scheme of mounting the control levers in the middle, directly on the transmission in the case of a unit transmission, but still kept the steering wheel at the right, making it necessary to shift gears with the left hand. This position of the levers was a happy thought. It not only got well clear of all interference between body and levers but it proved a simpler and better manufacturing arrangement than mounting the levers independently on the frame.

While many cars requiring gear shifting with the left hand have been manufactured, and those who are accustomed to them say they are just as convenient as any, still the public generally seems not to have taken kindly to the idea and the logical step was to move the position of the driver to take full advantage of the newly found best position of the control levers. The majority of American manufacturers seem to have reached this conclusion at once, as most of them changed to left drive and center control the same year.

If this arrangement is such an advantage in American cars why has it not been taken up by the leading European makers? I believe that is largely because of the different organization of the industry in Europe, particularly because the cars are not ordinarily built with standard bodies. The result is that problems of the body builders do not so promptly react on chassis design. I believe Europe will eventually follow America's lead in this respect.

It thus appears that the reasons for left drive for export cars are about the same as for cars for domestic use, with the additional reason that any such extensive change in the design of part of the product of a factory causes much greater confusion and expense than would

(*Continued on page* 25)



Six-cylinder 200-*hp. Austro-Daimler engine. Cylinder dimensions,* 135 *x* 175 *mm.*

Austro-Daimler 200-Hp. Aircraft Engine

Report on an Austrian Aircraft Engine Issued by the Technical Department of the British Air Ministry—The Engine Described Was Fitted to a Berg Single-Seater Scout

THE following detailed report on the design, construction and general performance of the latest type of Austro-Daimler engine is based on an examination and tests carried out at the R. A. E. on the engine (No. 19,218) taken from a captured Austrian Berg scout (R. A. F. No. A. G. 6). This machine, a single-seater biplane brought down on the Italian front in April, 1918, was captured in very good condition; the engine had apparently only been in use for a few hours.

With the exception of its high stroke—bore ratio—and the construction of a detachable inlet valve seating in each cylinder, the design of this engine shows no great resemblance to the earlier types of Austro-Daimler engines; generally speaking, the new 200-hp. Austro-Daimler possesses more than the usual amount of originality in design found in aircraft engines.

The general construction of the 200-hp. Austro-Daimler is shown in the photograph of the complete engine, Fig. 1, and also in the accompanying cross-sectional and general arrangement drawings.

Following the usual German practice, the engine is of the six-cylinder, vertical, water-cooled type with separate built-up steel cylinders. The principal characteristics of the design and its general performance are given in the following leading particulars:

Number of cylinders	Six, vertical.
Bore	135 mm.
Stroke	175 mm.
Normal b.m.e.p.	123.3 lb. per sq. in.
Average b.h.p. and speed	200 b.h.p. at 1400 r.p.m.
Compression ratio	5.02:1.
Fuel consumption per hour	111.0 pints.
Fuel consumption per b.h.p. hour	0.555 pint.
Oil consumption per hour	7 pints.
Oil consumption per b.h.p. hour	0.035 pint.
Total weight of engine, dry	728.5 lb.
Weight per b.h.p. (normal)	3.64 lb.

High Compression Ratio

The compression ratio is considerably higher than that of any of the enemy engines except the Maybach, and from the complete data published at the end of this report it will be seen that the general efficiency of the engine is good, the hp. per cu. ft. of stroke volume being 377.3 and the hp. per sq. ft. of piston area being 216.6.

During calibration and endurance tests carried out at the R. A. E. the running of the engine was very good, being very steady and between 700 and 1700 r.p.m. The engine was remarkably clean, having no trace of oil or water leakages during tests.

Compared with the usual high weight standard of enemy engine design, the weight per b.h.p. of 3.64 is quite normal. From our own standard of weights, however, the weight per b.h.p. is disproportionately high. This is chiefly due to the heavy construction of the crank chamber and oil base, rather than to the design of the cylinders and reciprocating parts, which are well designed and are of light construction compared with other enemy engines.

As a preliminary survey of the general design of the 200-hp. Austro-Daimler engine, the principal features of the engine are briefly described and illustrated in the following summary:

The six separate cylinders are of the usual built-up steel construction with pressed steel water jackets and are fitted with twin inlet and exhaust valves in the cylinder heads, which are integral with the cylinder barrels. The valve pockets are welded into position, with the exception of one inlet valve pocket in each cylinder, which is constructed so as to be easily detachable with its valve seating and guide, as in previous Austro-Daimler engines, so that all the valves can be removed without dismounting the cylinder.

Aluminum pistons are adopted, and, with the exception of those recently fitted to the 230-hp. Benz engines, were at the time of capture apparently the only aluminum pistons in use in enemy engines, although since this engine was captured a Rumpler biplane has been brought down fitted with a 270-hp. Bassé-Selve engine using aluminum pistons. A detailed report of this engine is in course of preparation and will be published shortly.

The H section connecting rods are of normal design, and the crankshaft runs in seven white metal bearings, which are carried by the top half of the crankcase. The bottom halves of the journal bearing housings are steel forgings and are very deep in cross section, being similar in design to the journal bearings fitted to the Maybach engines.

The design of the valve gear and camshaft drive presents several interesting details. As shown in the illustrations of the engine, the overhead camshaft is driven by a vertical shaft off the front end of the crankshaft. The camshaft runs in four phosphor bronze bearings in the center of an aluminum camshaft case.

A compression release gear, very similar to the Mercédès type, is provided. The water circulation passage from the cylinders to the top of the radiator is taken through to the front end of the cast aluminum camshaft-casing, just behind the driving bevel gear.

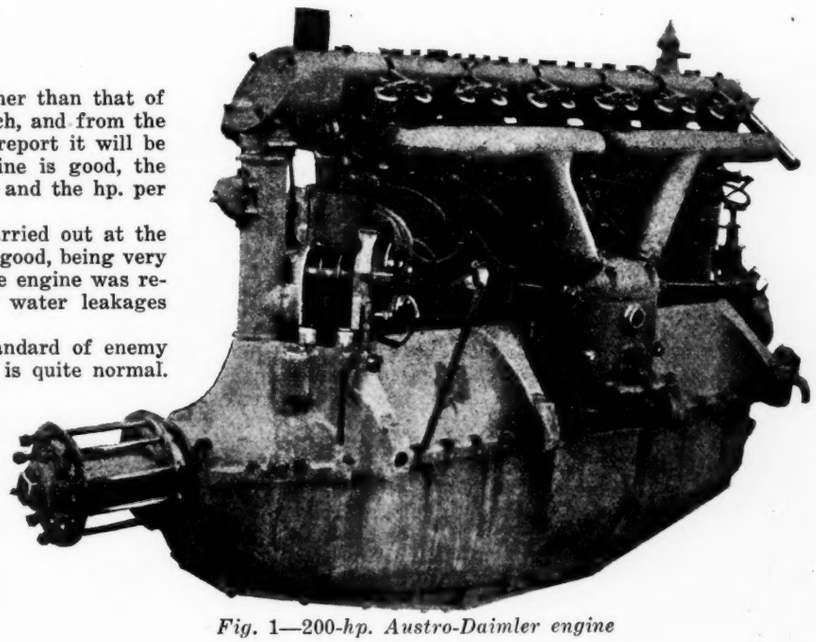


Fig. 1—200-*hp. Austro-Daimler engine*

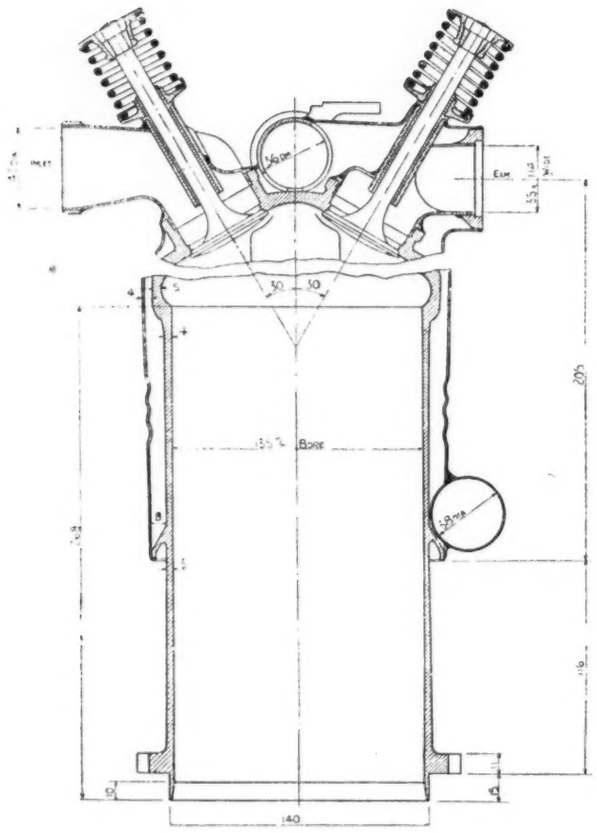


Fig. 2—Cross section of cylinder

A reciprocating plunger type oil pump is fitted in the front end of the oil base. This pump is driven by bevel and worm gearing directly off the crankshaft and is unusually heavy, but of interesting design.

The lubrication is on normal principles and embodies a large air-cooled oil sump at the bottom of the base chamber, which is supplemented by an auxiliary fresh oil reservoir cast in the front end of the top half of the crank chamber. The fresh oil is delivered by a small auxiliary plunger, working in conjunction with the main oil pump, to the front end of the camshaft, the lubrication of which is well carried out.

A "V" type honeycomb radiator is fitted directly behind the propeller, and the centrifugal water pump, which is driven obliquely off the rear end of the crankshaft, is of ordinary design.

Two Bosch Z.H.6 magnetos are driven diagonally at 52 deg. off the vertical camshaft driving shaft at the front of the engine, and two plugs are provided in each cylinder. The magneto controls are interconnected with the throttle control, so that the ignition is automatically retarded when throttling down.

A heavy duplex carbureter feeds the cylinders through two separate steel induction manifolds, which are galvanized, and lagged with asbestos; each manifold feeds three cylinders. The carbureters are water-jacketed and heated by the cylinder water circulation system in the usual way.

Main and slow-running jets are fitted, the two annular floats being housed in chambers surrounding the choke tubes. The main air intake is taken through a passage cast in the two halves of the crankcase, leading to the chamber below the false bottom of the oil sump.

An air pump of the spring plunger type is driven off the camshaft and is mounted on the top of the camshaft casing toward the rear end of the engine. A transverse shaft driven off the rear end of the crankshaft carries two cams for the synchronized gun interrupter gear. No exhaust manifold is provided, each cylinder being fitted with a short streamline section exhaust pipe about 12 in. long, as shown in the illustrations of the engine.

The six separate cylinders are made entirely of steel. The cylinder barrels, which are integral with the heads, are built up of steel forgings. The barrels are machined all over, and are ground to 135 mm. bore; the thickness of the cylinder walls tapers on the outside from 3.0 mm. at the center to 4.0 mm. at the top, and 4.0 mm. at the base. The water-jackets are pressed in the usual way from sheet steel 1.0 mm. thick, and are very short. The bottom of each water-jacket is flanged over and welded to a beveled flange which is machined on the cylinder barrel; three annular corrugations are formed in the water-jackets to allow for expansion.

Two inlet and two exhaust valves are fitted in each cylinder head, and work at angle of 30 deg. to the vertical axis of the cylinders. These are clearly shown in the cross-sectional drawings of the cylinder, Fig. 2.

In each cylinder two of the exhaust pockets and one of the two inlet pockets are pressed and welded into the head. The other inlet valve, with its seating and guide, is carried in a separate detachable pocket, fixed in position by a large gun-metal union nut, as in previous Austro-Daimler and Beardmore engines. This allows the other valves to be withdrawn from the cylinder through the opening left on the removal of the pocket, without disturbing the cylinder.

The flanges at the base of the cylinders are 11.0 mm. thick, and the cylinder spigots extend 15 mm. into the crankcase. Lugs are machined in the base flange of each cylinder to take the eight studs which bolt each cylinder to the crankcase. Four of the studs are of larger diameter, *i. e.*, 19.0 mm., and pass through the crankcase upper half; they act as main holding-down bolts and secure the lower portion of the journal bearings, thus relieving the crankcase of most of the working stress.

The total weight of each cylinder, bare, is 18.4 lb.

Pistons

These are of cast aluminum; the crowns are very slightly concave, and are supported by eight radiating ribs, as shown in detail in the sectional drawing, Fig. 3. It will be noticed that these ribs are not spaced equidistantly, the two ribs over each of the piston pin bosses being closer together and extending downward so as to support each boss from below.

This design undoubtedly provides a much better distribution of the stress than in the design of the new 230-hp. Benz aluminum pistons. Steel bushes are cast into the piston pin bosses in the pistons, and the piston pin is fixed only by a large split pin, which passes through a hole drilled in the boss; these holes are also fitted with steel bushes.

Three plain cast-iron rings are fitted above the piston pins, and an annular groove is machined around each piston on the piston pin level for lubrication.

The weight of each piston is 3.52 lb. with rings, and the weight of each piston pin is 0.66 lb.

The connecting rods are of H section and exceptionally long for the size of the engine; from the German standard of

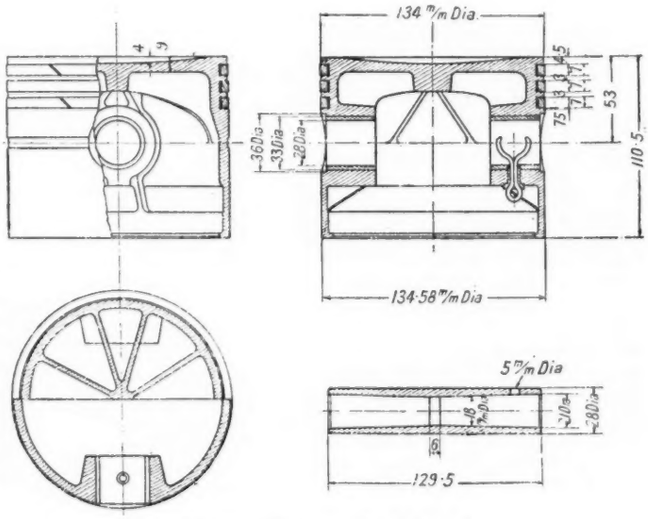


Fig. 3—Piston and piston pin

weight they are of comparatively light section, but the central webs of the rods are not drilled. Four bolts are used to hold the halves of the big-end bearings. These bolts are 10 mm. dia., and each pair is locked by a sheet steel clip.

The white metal lining of the bronze big-end bearing shells is 1 mm. thick, and the small ends are fitted with phosphor bronze bushes for the piston pin bearings, which are lubricated by small diameter pipes attached to the central web of the rods in the usual way. Two horizontal oil grooves are cut in the lower halves of the big-end white metal bearings, and a short transverse oil groove in the top halves, while the small-end bushes are provided with three longitudinal oil grooves.

Weight of the complete connecting rod.. .... = 4.84 lb.
Weight of big end ..... = 3.18 lb.
Weight of small end ..... = 1.66 lb.
Length of connecting rod between centers..... = 315 mm.

Valves and Valve Gear

The twin inlet and exhaust valves are all of the same dimensions and are interchangeable, and, as previously mentioned, work at 30 deg. to the vertical cylinder axis. The largest diameter of the valve heads is 48 mm., and the effective diameter is 44 mm., which gives a combined inlet valve opening area of 4.24 sq. in. The mean gas velocity through the inlet valves is 140 ft. per second.

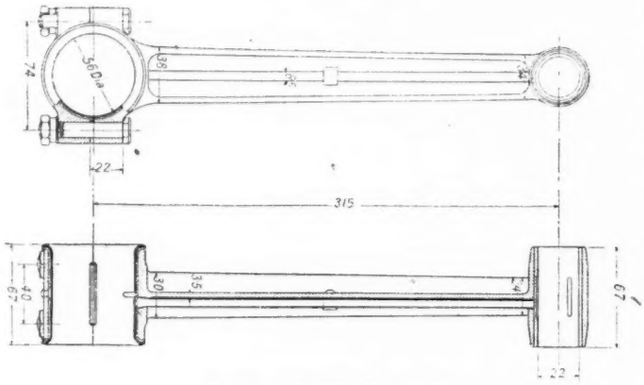


Fig. 4—Connecting rod

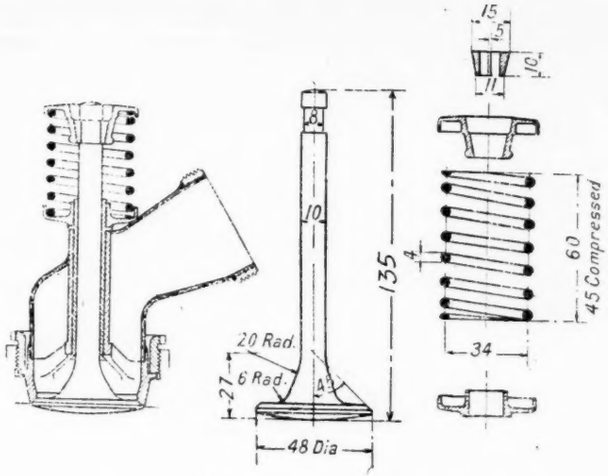
Single helical valve springs are fitted to each valve, and the valve spring collars are held in position by split cones, which register with the recess cut in the end of the valve stem, as shown in Fig. 7. This spring locking device is similar to that used in the Benz engines. The valves are operated by a single overhead camshaft which is carried in an aluminum case, running the whole length of the engine in one piece. This case is attached to each cylinder by two studs screwed into lugs formed in the cylinder heads.

The camshaft runs in four phosphor bronze bearings; these bearings are split and mounted in aluminum housings, and are located in the camshaft casing by small taper grub screws. The cover of the camshaft is in three parts, with very close joints. These detachable covers permit easy access to the valve gear of any or all of the valve rockers and cams.

Valve Rocker Spindle

Each valve rocker spindle is carried in three separate phosphor bronze bushes, which are housed half in the lower portion of the aluminum camshaft casing and half in the camshaft case cover. For ease of manufacture the boring of the cover and case is carried out as two continuous holes running the whole length of the case, and forming long semicircular grooves in both halves, in which the valve rocker spindle bearings lie. These bearings are held in position by dowel pins, and the center bearing of each set is of course split.

With the exception of the bridge pieces, which operate the valve stems, the valve rocker levers are machined from single steel forgings, and the bridge pieces, which carry the adjustable tappet screws, are pressed and riveted on to the ends of the rocker arms against a shoulder. The bridge pieces are prevented from swivelling by being let into a recess cut in the base of the shoulder. The ends of the adjustable tappet screws are hardened and are fitted with the usual type of transverse locking bolt.



Figs. 5, 6 and 7—Valve seat, valve and spring

Hardened steel rollers are fitted to the inside arms of the rocker levers, and a deep oil groove is milled in the top of these arms to convey oil through the hollow spindles to the bearings and also to the cam rollers.

Camshaft Driven from Front End

Compression release cams are formed on the exhaust cams, and the lateral movement of the floating camshaft is effected by a long hand lever at the rear end of the engine. This lever is attached to a gun-metal collar, which is fitted with a square thread screw, the design of this compression release gear being very similar to that used on all the Mercédès engines.

The camshaft is driven from the front end (which is quite unusual in enemy engines) through a bevel gear, which floats on eight splines cut on the end of the camshaft. The camshaft vertical driving shaft is driven directly from the front end of the crankshaft by bevel gears. The top end of the vertical spindle runs in a combined thrust and radial bearing, and the lower end (which has six splines cut in it) floats in the lower bevel gear, which with its bearing and housing forms a separate unit, and need not be disturbed when withdrawing the vertical spindle.

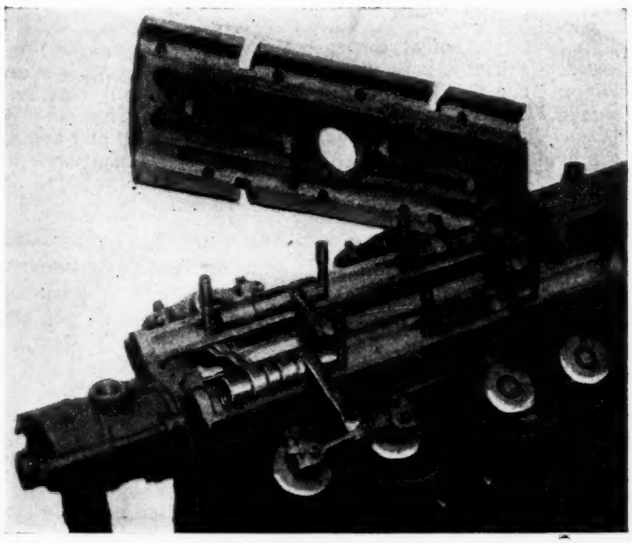


Fig. 8—Camshaft and housing, with cover removed

Details of Crankshaft

Number and type of main bearings	Seven bronze cage, lined white metal
Cylinder centers	166.0 mm. (6.53 in.)
JOURNALS	
Outside diameter	58.0 mm. (2.28 in.)
Inside diameter (front two)	21.0 mm. (0.82 in.)
Inside diameters (others)	30.0 mm. (1.18 in.)
Length airscrew end	56.0 mm. (2.20 in.)
Length rear end	43.5 mm. (1.71 in.)
Length center	50.0 mm. (1.97 in.)
Length intermediate	50.0 mm. (1.97 in.)
CRANKPINS	
Outside diameter	56.0 mm. (2.20 in.)
Inside diameter	30.0 mm. (1.18 in.)
Length	68.0 mm. (2.67 in.)
CRANK WEBS	
Width	74.0 mm. (2.91 in.)
Thickness (front two)	24.5 mm. (0.96 in.)
Thickness (others)	24.0 mm. (0.94 in.)
Radius at end of journals and crankpins	4.5 mm. (0.17 in.)
Weight of complete shaft	96.5 lb.

The six-throw crankshaft is of normal design and requires little description. The usual type of plain white metal bearings are used. The diameter of the journals is 58 mm. and of the crankpins 56 mm.; the length of all the journal bearings is 50 mm., with the exception of the front bearing, which is 51 mm.

All the crankpins and journals are bored 30 mm. dia., except the two front journals, which are 21 mm. bore; and the webs are drilled with 5 mm. oil leads in the usual way for pressure lubrication. Brass discs are used to plug the ends of the holes bored in the journals and crankpins. These are expanded into grooves cut in the ends of the holes. Other details of the design of the crankshaft are given in the drawing, Fig. 9, and the construction of the front ball bearing and propeller double thrust race is clearly shown in the general arrangement sectional drawing of the engine on page 20.

Propeller Hub

The method of attaching the airscrew hub by serrations cut on the outside of a sleeve which fits onto the tapered extension of the crankshaft follows the original design of the previous Austro-Daimler and Beardmore engines. In other respects the construction of the airscrew hub is of ordinary design, but compared with those used on most other enemy engines the weight of the airscrew hub is considerably below the average—viz., 11.3 lb.—less the crankshaft extension. Details of the propeller hub are given for reference in Fig. 10.

Crankcase (Top Half)

The construction of the cast aluminum crankcase is proportionally heavy, both in the design of the top and bottom halves. The top half weighs—with main journal bearings complete and cylinder holding down bolts and studs—133.4 lb., and the bottom half, which forms the oil base and sump, weighs no less than 73.5 lb. dry. This makes a total weight

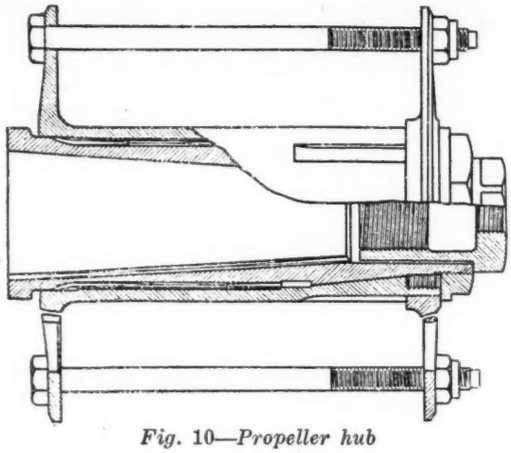


Fig. 10—Propeller hub

of 207 lb., approximately, for the complete crank chamber, which works out at 28 per cent of the total weight of the engine.

The transverse webs which form the crankshaft journal bearing housings are of the usual box section, and the eight engine bearer arms cast on the crank chamber, four on either side, are made as continuations of the transverse webs, and are of the same section; they are exceptionally deep.

The front portion of the top half of the crankcase is constructed to form the feed oil tank. This tank, as shown in the section on the general arrangement drawing of the engine, encloses the bottom portion of the camshaft vertical driving shaft, and is fitted with a filling cap and oil filter and also with a glass sight-level oil gage. The capacity of the feed tank is approximately one gallon.

The efficient ventilation of the crankcase, as in most of the enemy engines, has been well provided for. Two breathers of normal design are fitted on the exhaust side of the crankcase, and a passage is formed in the body of the carbureter, which communicates with the interior of the crank chamber through a large port cast in the side of the crankcase.

This passage also communicates with the crank chamber by two large holes cast in the webs of the central bearing housing. The primary function of this passage is, of course, to assist in heating the carbureters, which are also water-jacketed.

The average thickness of the walls of the crank chamber is 9 mm. *(To be continued)*

IN view of the wide public interest taken in the British Scientific Products Exhibition, held at King's College, London, during the past summer, the British Science Guild has decided to organize another exhibition next year. The main object of the exhibition will be to stimulate national enterprise by a display of the year's progress in British science, invention and industry. A large part of the recent exhibition has been transferred to Manchester, where it will be on view at the Municipal College of Technology toward the end of next month.

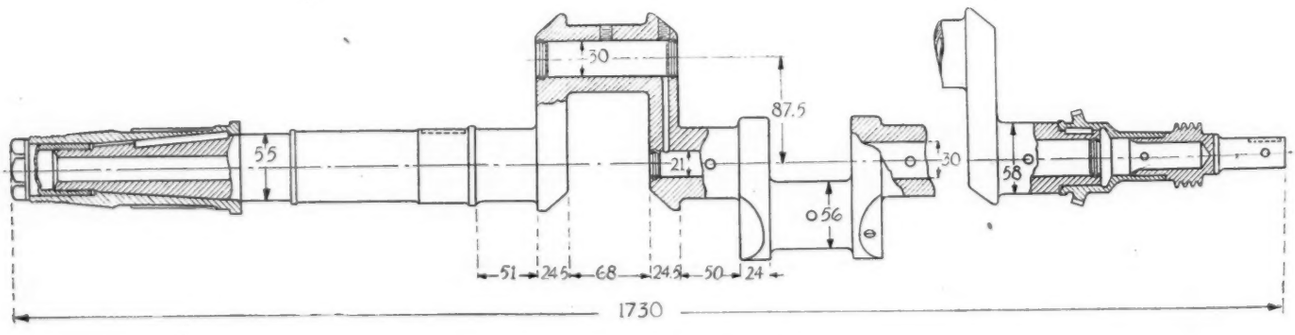


Fig. 9—Sections of the crankshaft

Effect of Temperature on Spark Plug Insulations

Experiments Carried Out in England Show That Minimum Permissible Insulation Resistance Varies with Frequency of Sparks and Compression Pressure

IN a recent issue of AUTOMOTIVE INDUSTRIES was published an article by Dr. Cunningham on the effect of temperature on the insulation of spark plugs. This subject is of considerable interest in connection with aircraft engines, as these operate at high compression, and all parts exposed to the flames reach extraordinary temperatures.

The subject seems to have received some attention also in England, and a brief article dealing with it is published in *Engineering* of Nov. 8, by J. D. Morgan. Mr. Morgan divided his investigation into two parts, the first relating to the leakage resistance of the insulation which would just prevent firing of the plug, and the second to the variation of the insulating properties of different plug insulators with temperature.

For the purpose of determining the leakage resistance which would just cause a spark plug to fail, a plug was secured to a compressed air chamber (of the kind frequently used for testing plugs and spark generators) and in parallel with the plug was arranged a variable water resistance. This system was connected in turn to a magneto and an induction coil, and the resistances just capable of putting out the spark at different speeds were measured by a "megger." Each apparatus was tested with the plug gap under air pressures of 60 lb. and 90 lb. per sq. in., the sparking voltages being respectively 6400 and 8800. Mr. Morgan states that the magneto was capable of overcoming a larger plug leakage than the induction coil.

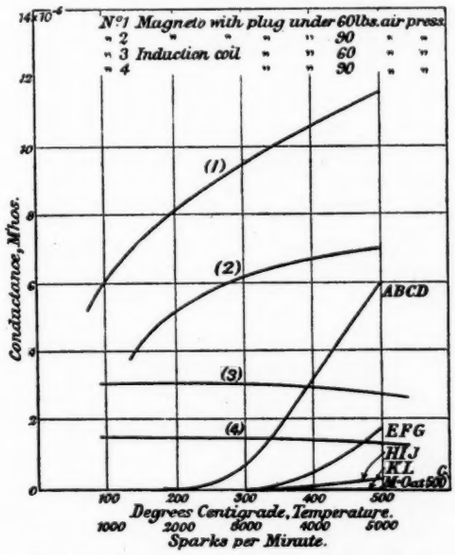
In the test of the plug insulations, each plug was tested as a whole, that is to say, with the insulation contained in its metal body as in service, and each plug in turn was heated in a small electric muffle. A "megger" was connected by wires with the central electrode and the body, and the temperature of the muffle interior was indicated by a thermocouple instrument. Before each test, the plug was heated for one hour at 500 deg. C., and the resistances were taken at intervals during the subsequent cooling.

All of the results are plotted in the chart. Curves 1, 2, 3 and 4 show the insulator conductance in mhos which will just suffice to completely prevent sparking by a magneto or an induction coil under 60 and 90 lb. air pressure respectively. The other sets of curves, A to M, show the conductances of the insulators of the spark plugs at different temperatures. In this connection it may be pointed out that the conductance in mhos is the reciprocal of the resistance in ohms. All of the insulators were of porcelain, with the exception of K, L and M, which were of mica. It will be seen that the limiting conductance increases with the number of sparks produced per minute. This latter basis of comparison was chosen by Mr. Morgan, rather than speed of rotation, because his battery set was a six-cylinder set and his magneto a four-cylinder machine.

From the diagram it will be seen that with insulators A, B, C and D, the conductance at 340 deg. C. (644 deg. Fahr.) has increased so much that when working with battery ignition under 60 lb. compression, ignition fails. With a magneto under conditions corresponding to line 2 (60 lb. compression) sparking would cease at 500 deg. C. In the case of plugs H to M, temperatures up to 500 deg. C. would have no effect on the ignition with either the coil or the magneto.

In interpreting the results of these tests it is necessary to bear in mind that the spark voltages, while of the order used in the testing of spark generators, are undoubtedly higher than those used in engine practice. There the spark voltage is usually of the order from 5000 to 6000. The difference between these figures and those of the tests may be accounted for by the higher temperature of the gases. In the tests the temperature in the compressed air chamber was that of the atmosphere.

The net result of the investigation is that insulation leakage due solely to temperature is not so serious a matter as curves showing the resistance variation with temperature seem to indicate.



The temperature scale is to be used in connection with the lettered curves and the "sparks per minute" scale with the numbered curves

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Left-Side Drive for Export Cars

(*Continued from page* 19)

result from changing the design of the whole product. The additional expense must, of course, be borne by the export trade. It only remains for us to get together and show our foreign customers that we can build cars for them both better and cheaper as we build them for home consumption than we can with special export features. Once the novelty of the left drive has worn off they will not object to it any more than our domestic customers do now.

A few years ago the members of the National Automobile Chamber of Commerce got together on the elimination of sixty-inch tread for Southern roads. Why should they not now agree upon the elimination of this greater nuisance of both left and right drive models?

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The Passing of National Shows

EVER since it became customary to hold automobile shows in all of the more important cities there has been a certain anomaly in the show situation. With the exception of two of these shows—at New York and Chicago—they were held by local dealers' organizations. The dealers of Detroit, Cleveland, Buffalo, etc., each year held their show, but the dealers of New York and Chicago were deprived of this privilege. In these cities the shows were held under the auspices of the automobile manufacterers' association. They were called national shows, while the shows in the other cities were designated local shows. Yet the character of all of these shows was not materially different. In the early years New York and Chicago undoubtedly had a great lead in the number of exhibits, but this gradually vanished, and of late several of the local shows, including those held at Boston and Minneapolis, have outstripped the former leaders in this respect.

The situation in the show field is the natural result of historical development. When automobile manufacturers first decided to promote their business by holding shows they settled upon New York and Chicago as the cities where this could be done most effectively. Local promoters soon made efforts to get them to exhibit in other cities also, but the manufacturers felt that two shows each year were all they would want to patronize, and so resolutions were passed which prevented manufacturers from taking part in other shows.

Later, when the system of selling automobiles through local agencies became well established and agencies in the larger cities had become quite numerous, these agents saw in the show a means of stimulating automobile interest locally. Local dealers' organizations were formed and shows put on, first in the more important cities, such as Boston, Philadelphia, Kansas City, etc., and later also in smaller places. A regular show circuit was soon arranged, with dates set so that exhibits could be conveniently moved from one show to the next. Thus, of the local shows the Philadelphia show was generally the first, coming immediately after New York.

There are two things that made the New York show stand out among others. The first was that it was generally the first of the season, at which new models of cars and new accessories and parts were first exhibited to the public, so that there was much more novelty attached to this than to the other shows. The other point in which the New York show was ahead was that it was held in the greatest purchasing center of the country. This held especially in the earlier period before the automobile had become a necessity on the farm. Of late years, however, the demand for automobiles has spread much more evenly throughout the country. While for a great many years New York State held the leadership in respect to number of cars owned in proportion to population, this lead has now passed to Iowa.

Although the New York show, even up to last year, undoubtedly drew visitors from more States than any of the so-called local shows, it was in no sense a truly national show. In the early years it was to quite an extent a trade show, held for the purpose of securing agents in the Eastern territory. However, as agency connections became more permanent, changes in models less radical, and the dates of the show and the beginning of the business year of most firms more widely separated, this feature lost much of its one-time importance. The show has always had the character of a great public entertainment, with decorations sometimes rather extravagant, concerts, and a general holiday air. There have been spasmodic attempts on the part of individual manufacturers to put a stop to the show, but everybody always felt that as long as the show was held he could not afford to be absent. The momentum acquired in a decade and a half kept the thing a-going in the old channels, and it required the disruptive influence of a world war to bring about a change for which many manufacturers had been yearning for years.

Hereafter, New York and Chicago will have the same sort of show as in previous years, with just as

many car models and probably as many accessories on exhibition as formerly. But the shows will be in charge of the local dealers who control the sales in this territory. One advantage to be expected from the new arrangement is that there will be less interference with production at show time, which usually coincides with the busiest period of the year in the factories.

France as a Future Competitor

PREVIOUS to the war France was the largest automobile exporter in the world, her exports in 1913 having amounted to 24,167 tons, which may be taken to represent about that number of chassis. Even then, however, the United States, owing to the low prices at which it furnished reliable vehicles, had become a formidable competitor. The outbreak of hostilities entirely stopped French exports, while in the case of the United States, after a slight flurry due to disorganization of transport and financial services, it had the effect of greatly stimulating the export of both passenger cars and trucks, until the record set by France was greatly exceeded. With the entrance of this country into the war and the restrictions placed upon the production of both passenger cars and trucks, our exports of cars have dwindled away, and as by Jan. 1 next all our manufacturers would have been on a 100 per cent war work basis, our foreign automobile trade by this time would have reached about the same low level as that of France, had not the war come to a timely end.

In the future France will undoubtedly be our most formidable competitor in foreign markets. Like every other industrial country, she is dependent upon the export of manufactured goods in order to maintain a favorable trade balance. Until now a very important item in her exports to the United States has been that of wines and liquors, and it now looks as though this business might be permanently stopped. The resulting decline in exports would be an incentive to France to force export business in other lines, particularly automobiles.

It must be remembered that the French automobile industry is well organized. There are numerous firms engaged in this line and French designers are admittedly very talented. In production methods France has been somewhat behind other countries, and this prevented her from selling cars on a strictly competitive basis, but it is quite conceivable that the war, together with the extensive importation of American machine tools, has wrought a change in this respect. Moreover, France now has possession of the minette iron ore deposits in Lorraine which will greatly add to her iron production and no doubt give a great impetus to all branches of her mechanical manufacturing industry.

That French manufacturers are alive to the situation that will confront them now that free competition for the world's automobile market has begun once more, is evidenced by the publication of a book on "The Automobile After the War," by Georges Cote, a well-known manufacturer. Mr. Cote seems to have discovered much that is good in American methods both of production and distribution, and he advocates the adoption of similar methods by his fellow-manufacturers. It is quite refreshing to see a French manufacturer recognize the merits of American automobiles. Previous to the war they sought to belittle our cars by the use of such artful phrases as "absolutely lacking in grace of lines," or "thrown together like coffee grinders," but the numerous cars of American construction which found their way to France during the war have evidently given a good account of themselves and convinced Frenchmen that although our machines may not conform to their ideas of attractiveness they are nevertheless most serviceable.

Our Available Petroleum Resources

IT is not necessary to note statistics in order to convince a thinking person that the consumption of petroleum is increasing at an enormous rate and that in a not very remote age there must appear signs of exhaustion of our oil fields. Drilling for petroleum in the United States began only in 1859, and for the first two decades the production was insignificant as compared with the amount now taken from the wells each year. In 1900, when the automobile was first put on a production basis, the mining of petroleum received a great impetus, the census of production showing a very sharp deviation from its previous direction at this point. From 1900 to 1910 the production substantially quadrupled and since then there has been a further increase of about 60 per cent.

So far what has worried the internal combustion engine interests mainly has been that the increase in the demand for the light fractions, which are most suitable for use in small, high-speed engines, has been much more rapid than that of the other fractions, with the result that the prices of the lighter fractions have gone up very much more than those of the others. During the past year, however, in consequence of the unprecedented industrial activity, there was a decided shortage of fuel oil. While this was in no way due to there being insufficient oil in the ground to meet the requirements still it draws attention to the fact that the increased consumption of petroleum is not solely due to the rapidly increasing use of internal combustion engines in automobiles, motor boats, tractors, airplanes, etc., but that industrial uses also called for increased supplies.

In a report presented to Congress in 1916 on the productive possibility of all known pools in operation and estimates of undeveloped areas, the petroleum reserve of the United States per capita based on a population of 100,000,000 is given as about 70 barrels. The meaning of this figure can be gaged when it is stated that in 1917 alone the production was 3.4 barrels per capita and during the period 1859-1917 the aggregate production was 42 barrels. These figures are most portentous.

□ Latest News of the

Want Prompt Action on Dent Bill

Measure Validating "Illegal" Contracts Urgently Needed to Help Transmission

WASHINGTON, Dec. 28—Prompt action by Congress on the bill authorizing the Treasury to pay on contracts which were not "legally" executed was impressed upon the House Committee on Rules to-day by Secretary of War Baker and his assistant secretaries, Crowell and Stettinius.

The bill, which was published last week in AUTOMOTIVE INDUSTRIES, provides for the payment of all just contracts which were made by telegraph, telephone, letter or verbal agreement and which the Controller of the Treasury has refused to recognize.

The House Committee voted to report a special rule January 2 providing for immediate consideration of the bill. Secretary Baker pointed out the need of prompt action to enable the Government to meet its honest obligations and deal equitably with business firms that have gone ahead with hurry-up work for the war emergency.

He said that large sums of money are at present tied up, making undue hardships and threatening serious consequences if action is not taken. Assistant Secretary Crowell stated that more than $1,675,900 is involved in contracts which were not legally executed with manufacturers in the United States.

Inability of these concerns to resume work because of lack of funds is already apparent, he said, by increasing unemployment following the return of discharged soldiers. "These contractors have their working capital tied up," Mr. Crowell explained, "and resumption of their business cannot proceed. A few of these industries have gone to work." The War Department has received telegrams from many saying that bankruptcy proceedings would result in a week or two unless they got a settlement. Banks also are looking skeptically at these contracts.

The most serious objection to the bill drawn up by Congressman Dent and which will be considered Thursday is that it eliminates all profits, even the 10 per cent profit which was to be allowed. This feature, it is expected, however, will be overcome by an amendment offered when the bill is on the floor. Many of the contracts which were not legally executed are with manufacturers in Great Britain, France and Italy and these countries, in settlement of contracts, always recognize that the contractor is entitled to a profit and for this reason alone it will be necessary to allow for the payment of some margin of profit.

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No More Supplies to Air Service

WASHINGTON, Dec. 30—No aviation supplies of any kind are being shipped to the American Expeditionary Forces and none will be. The air forces abroad are being demobilized as rapidly as possible. This information was made public here to-day by General Peyton C. March, when he stated that "the air forces are being demobilized with the greatest rapidity."

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Reeves Leaves Washington

WASHINGTON, Dec. 30—Albert Reeves, General Manager of the National Automobile Chamber of Commerce, who has been in Washington for some time conducting the office here, will return permanently to New York City Jan. 3. The Washington office will be continued indefinitely and will be conducted by Harry Perry.

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Gerstner Field Destroyed

WASHINGTON, Dec. 30—Gerstner Flying Field, Louisiana which was destroyed by a hurricane Aug. 6, will be reconstructed. The cost will probably amount to $130,000.

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Ford Makes Basic Rate $6 a Day

DETROIT, Jan. 2—The Ford Motor Co. which in 1914 established a basic daily rate of pay for its employees of $5, has raised this to $6 effective with the opening of the new year. The increase affects 28,000 men employed in both the passenger car and tractor factories as well as Ford employees in the various assemblying plants throughout the country. The resignation of Henry Ford as head of the Ford Motor Co. is confirmed and his son Edsal has been formally elected president of the company at a salary of $150,000 a year. Henry Ford is to devote his time to his tractor interests and to the publication of a newspaper, as previously made public. B. G. Craig, assistant treasurer for the Ford company, has been elected secretary and Ernest G. Liebold, personal secretary to Henry Ford, will follow him to Dearborn to assume an executive position with the tractor company.

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Baker Sales Manager of Kelly-Springfield

SPRINGFIELD, O., Jan. 2—John Baker, Jr., has been appointed general sales manager of the Kelly-Springfield Motor Truck Co.

Military Aeronautics on Peace Basis

Colonel Edgar Heads Organization Board—Half of Personnel Wants Release

WASHINGTON, Dec. 30—A peace time organization for the Department of Military Aeronautics has been arranged under Major General William L. Kenly as follows:

BOARD OF ORGANIZATION

Colonel C. G. Edgar, Colonel F. R. Kenney, Colonel A. Woods, Major E. Hubert Litchfield, Recorder.

Operating under this Board are the following sub-boards:

DEMOBILIZATION

Lt. Colonel George B. Hunter, Chairman, Lt. Colonel Rush B. Lincoln, Major Walter George Rogers.

OPERATIONS IN PEACE TIMES

Colonel William E. Gillmore, Chairman, Colonel Gerald C. Brant, Lt. Colonel Thomas Duncan, Lt. Colonel Barton K. Yount, Lt. Colonel Ira Longanecker, Lt. Colonel Benjamin F. Castle, Captain John W. Davis.

MUSTERING OUT

Major E. Hubert Litchfield, Chairman, Lt. J. J. O'Brien.

COMMITTEE ON TRAINING

Colonel Milton F. Davis, Chairman, Lt. Colonel John Armstrong Drexel, Lt. Colonel Seth W. Cook, Major William A. Robertson, Professor Edward L. Thorndike.

INVENTION AND RESEARCH

Captain Adelbert Ames, Jr., Chairman, Captain Robert R. McMath, Professor Wallace C. Sabine.

SUPPLY

Lt. Colonel Thomas G. Gallagher, Chairman, Lt. Colonel Harold Bennington, Major C. S. Benton, Major Walter G. Rogers, Major Eugene E. Deacon, Major Harold R. Eyrich, Capt. David R. Wheeler.

The officer in charge of demobilization announced recently that reports from all Air Service activities show the following preference on the part of the personnel, both commissioned and enlisted: One-eighth request complete separation from the service. Three-eighths request to enter the Regular Army. One-half request to enter the Reserve Corps.

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Detroit Field Named "Morrow"

WASHINGTON, Dec. 30—The Air Service Acceptance Park at Detroit will be known officially as Morrow Field in honor of Lt. Karl Clifton Morrow, aviator, who lost his life Nov. 11.

Automotive Industries

48 Get Show Space in New York

Dealers Draw for Places in Garden—62 Car and 27 Truck Men Get Chicago Space

NEW YORK, Dec. 28—Drawings for the New York and Chicago shows have been held by the dealers in those cities, and plans for the biggest and best shows ever are going forward in a gratifying manner.

The space has been nearly all disposed of and it looks now as though there would be a considerable number of applicants who won't be able to get in at all.

Reports being received by Manager Charles A. Stewart of the New York show indicate that the manufacturers will visit the big city as in former years, and that there will be the usual big influx of dealers from everywhere.

The Hotel Astor, just before the show dates were selected, urgently telephoned the dealers' association and asked for the show dates in order that a big pile of room reservations might be taken care of. When Stewart asked the Prince George Hotel, opposite the Garden, for a room for the use of the show committee, he was informed that the hotel was booked solid for the whole show period.

With the coming of peace and the resumption of production the indications are that the show crowds will be bigger than ever. Visitors are requested by the show committee to make their hotel reservations at once in order to be sure of a place to sleep.

The dates of the show are Feb. 1-15. The Chicago show is Jan. 25-Feb. 6. In each case the first week will be devoted to passenger cars and the second week to trucks.

Monday noon of this week the New York show committee and the New York newspaper men met at lunch at the Astor and laid plans for promoting the show and making it the best ever held. Newspaper men stated that this year they had begun their promotion work several weeks earlier than usual and that they were going to stay behind the project and boost it in all their travels throughout the manufacturing zones.

Manager Stewart stated that season tickets were to be sent to all the dealers within 700 miles of New York, and that any other dealers who came from anywhere would be given a cordial reception by the New York Automobile Dealers' Association and a season pass.

The annual meeting of the National Automobile Dealers' Association will be held during the Chicago show, and a big dealer mass meeting is being planned for Wednesday noon of the New York show. This will be addressed probably by President F. W. A. Vesper and some other speakers of national prominence.

The decorative schemes for both shows are, it is said, to be unusually attractive.

(*Continued on page* 40)

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Canada May Cut War Tax

OTTAWA, Dec. 30 — Announcement may be made shortly of the removal or modification of the war tax on automobiles. Representatives of the organized automobile industries of Canada waited on Sir Thomas White, acting Prime Minister, and Hon. A. K. MacLean, acting Minister of Trade and Commerce, and urged that the excise war tax on automobiles be removed. The tax which was imposed in the last budget amounts to 10 per cent on automobiles, and is applicable to all imported into or manufactured in Canada and unsold on April 30, 1918. The request of the automobile manufacturers is being considered at Ottawa.

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Bruske Leaves Harroun

DETROIT, Dec. 30—Paul Hale Bruske, after spending 2 years as advertising director for the Harroun Motors Corp., Wayne, Mich., has returned to the Power, Alexander & Jenkins Co., advertising agents. He will continue to supervise Harroun advertising. He will also have the supervision of the advertising campaigns of a number of Detroit manufacturers.

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S. A. E. Membership Increases

NEW YORK, Dec. 31—Membership in the Society of Automotive Engineers increased 717 during the year just closed. On Dec. 1, 1918, there were 3780 members, including affiliate membership representatives and enrolled students but not Section associates, as compared with 3063 on Dec. 1, 1917. During the year nearly 900 applications for membership were received as compared with 1400 during 1917. The percentage of applicants who qualified, however, increased from 72 per cent in 1917 to 84 per cent in 1918.

At the meeting of the council of the society, held Dec. 11, 313 applicants were approved for various grades of membership and one for student enrollment.

The following members were appointed to Standards Committee Divisions: Berne Nadall (Miscellaneous), Lieut.-Col. V. E. Clark (Aeronautic), Wayne H. Worthington (Tractor). President Kettering was appointed to represent the society on the Advisory Committee of the Engineering Division of the National Research Council.

Automotive Stock Transactions

Price Tendencies Have Been Almost Uniformly Upward During 1918

NEW YORK, Jan. 2—Transactions in automotive stocks on the New York Exchange during the past year show that the general tendency in price has been upward. Reference to the analysis on page 33 shows that as a rule automotive stocks touched their lowest points during the early months of 1918 and their highest during the fall. The last transaction of the year in each listed stock represents a price which is much nearer the highest than the lowest. Taking the list as a whole, a very healthy condition is indicated.

(*Continued on page* 33)

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Steering Wheels From Mansfield

MANSFIELD, O., Jan. 2—The Allerding Products Co. has been formed here and is to specialize in the production of steering wheels and wood rims for aircraft and other purposes. The company has a capital stock of $50,000, the directors being: C. N. Allerding, E. S. Walter and John H. Coss, of Mansfield; Charles S. Munson, Detroit; James Israel, Mt. Vernon, N. Y.; Fred R. Jones, Cleveland, and C. F. Allerding, Mt. Vernon. C. N. Allerding heads the company; other officers being: vice-president, Charles S. Munson; secretary-treasurer, E. S. Walter.

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Post Office Returns Airplanes

WASHINGTON, Dec. 31—The Post Office Department has turned back to the War Department 100 DeHaviland 4 airplanes, which, it is said, have proven utterly unfit for cross country mail flying. This action followed extensive flight and service tests between New York and Chicago and Washington and New York, which, it is said, showed the planes to be unadaptable for the heavy postal work. Postal officials stated here that a number of the planes crumpled in making landings and taking off for flights and several accidents, including one fatality, resulted. These planes were turned over to the Post Office by the War Department under the recent act of Congress.

The War Department has also furnished the Post Office 12 two-engined Handley-Page planes which will shortly be assembled and put on the New York-Chicago mail route. Until these planes are assembled the New York-Chicago mail service will be postponed.

Aircraft Exhibition Assured

To Be Staged Feb. 27-Mar. 6 in Madison Square Garden —Dinner on Jan. 7

NEW YORK, Dec. 30—There will be an aircraft exposition in New York Feb. 27 to March 6, both dates inclusive. The Aircraft Manufacturers Association has obtained an option on Madison Square Garden for that week, and though definite plans for the show have not been completed, it is stated that sufficient exhibitors are assured to make the event the most complete of its kind ever held.

Plans for the show are to be made public at a dinner to be held by the Aircraft Manufacturers Association at the Waldorf on Tuesday, Jan. 7. It is expected that probably 500 persons will attend, including as guests of honor representatives of the military, legislative and executive branches of the Federal Government. Arrangements for the dinner are in the hands of J. G. White, of the J. G. White Engineering Co.

It is planned to make the exhibit truly international in character. It will include exhibits of various American and Allied military airplanes as well as exhibits of engines and accessories.

The show has been made possible by the revocation of the Presidential proclamation forbidding aircraft exhibitions as inimical to the best interests of the country during the course of the war. This proclamation was issued on Jan. 1 of this year. Recently the Aircraft Manufacturers Association took up with Washington the matter of holding a show now that the war has ended. The War Department apparently was willing to extend its co-operation but could do nothing in view of the President's proclamation.

The matter was then presented to the Judge Advocate General, with the result that the whole matter was cabled to France. In the meantime the State Department had prepared a new order rescinding the former one and this, in turn, was cabled abroad for the President's approval. In consequence, the following statement has been made public by Washington:

"At the request of the Secretary of War, the President has authorized the issuance of a proclamation revoking the proclamation of last January prohibiting the exhibition of aircraft during the war. Pending the formal signing of the new proclamation, the Secretary of State has requested the Attorney-General not to prosecute any infringement of the earlier proclamation."

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Packard Develops National Service Bureau

NEW YORK, Dec. 30—The Packard Motor Car Co. of New York has formed an organization to serve particularly the transportation requirements of companies doing a national business. A. C. Harrington, for the past year vice-president of distribution for the New York company, will have charge of the new organization, and associated with him are F. H. Pietsch, manager of truck distribution for the Packard Motor Car Co. of Chicago, and James T. Adams, until recently manager of the Washington office of the company.

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Better Facilities for Tractor Show

KANSAS CITY, Dec. 30—Erection of the temporary building on the Union Station Plaza, where the Fourth National Tractor Show will be held Feb. 23-March 1, has begun. Steam pipes are being laid from the heating plant in the Union Station. A feature of the building at this show will be the suites of rooms for the use of exhibitors who plan meetings of salesmen, distributers and prospective dealers. Rest rooms, nursery and playrooms will be provided—eliminating one of the hindrances of previous shows, the children who have to be taken with parents looking at tractors. Inquiries and announcements indicate that many foreign governments will send representatives to the Kansas City show, where the tractors can be seen, and where touch can be effected with people from the districts using tractors most largely. Among the visitors announced are the Russian mission, the Italian delegation of agricultural engineers, a technical expert from the British minister of agriculture, a commissioner of the French government, commissions from South American countries, and representatives of foreign distributers of American equipment.

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Not All Plugs Certified

WASHINGTON, Dec. 30—The Federal Trade Commission to-day ordered the Silvex Co., Hellertown, Pa., to discontinue representations that its "Bethlehem aviation" spark plug has been "certified by the United States Bureau of Standards." The commission found that while large numbers of Silvex plugs had been furnished the Government and had been subjected to the usual Bureau of Standards tests, the Bethlehem aviation plug had not been "certified" by the bureau, as represented in a circular letter sent out by the company. The commission's order was issued by agreement with the company, which waived right to introduce testimony in support of the act.

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Now It's Captain Rickenbacker

PARIS, Dec. 6—Ex-race driver Eddie Rickenbacker is now captain and squadron commander in the American Air Service. Soon after the signing of the armistice Captain Rickenbacker was given orders to prepare to move his squadron forward into German territory. This move was made a few days ago, and Captain Rickenbacker is now flying from a German aerodrome. Before actual fighting stopped he had attained the position of Ace of Aces in the American Army.

First Post-War Car Exhibit

Will Be Lyons, France, Sample Fair—Number of American and Foreign Entries

PARIS, Dec. 4—The first post-war automobile show in Europe will be a portion of the Lyons Sample Fair to be opened in the Silk City on March 1, 1919. In order to take care of automobile manufacturers a special building has been erected in the fair grounds for automobiles only, and the participation of automobile manufacturers is being encouraged by the French manufacturers' associations.

The list of exhibitors which has already been gotten together shows that this automobile section will be of considerable importance. American firms are Goodrich and Overland. European automobile manufacturers who will have cars on exhibit comprise the following: Berliet, Blum, La Buire, Chiribibi, Cottin & Desgouttes, Delage, Delahaye, D. F. P., F. I. A. T., Hotchkiss, Panhard-Levassor, Rochet-Schneider, Th. Schneider, Turcat-Mery, Unic, Lorraine-Dietrich, De Dion Bouton, Peugeot, Rolland-Pilain, Vinot & Deguingand. In addition a large number of tire and accessory firms have booked space, among them being Bergougnan, Nilmelior Magneto Co., S. E. V. Magneto Co., Zenith Carbureter Co., Dunlop Tire Co., Lavalette Magneto Co. and Oleo Spark Plug Co.

In 1918 there were 3182 exhibitors at the Lyons Fair, and the amount of business transacted was $150,000,000. The 1919 fair will undoubtedly be the biggest ever held, for on Nov. 1 of this year 2103 firms had secured space, compared with only 978 twelve months previous. The exhibition is open to all allied and neutral nations, and space can be reserved until the last day of December.

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Wisconsin Good Tractor Market

MILWAUKEE, Dec. 30 — Wisconsin will furnish the tractor industry with an exceptionally fertile market during 1919, according to manufacturers and dealers who have given thought and studied figures issued by the State Department of Agriculture that in 1918 a total of 8,784,761 acres of crops were raised in this state, compared with 8,689,354 acres in 1917 and 7,915,904 in 1910, federal census year. While the increase since 1910 is considered a good one, it is felt that with more favorable means of prosecuting farm work such as the farm tractor provides a much larger acreage would have been yielded.

It is estimated that Wisconsin absorbed from 1200 to 1500 tractors during 1918. This made it possible to increase the crop acreage over 1917 by 95,407 acres despite the fact that approximately 50,000 Wisconsin farmer boys were called to the colors within the period.

At this time it is figured that 3000

Wisconsin farmers own tractors. In view of the fact that this state contains more than 80,000 farms of more than 100 acres each, the ratio is regarded as low and indicative of the large number of farms now without power machines which tractor dealers have available as potential tractor purchasers.

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Dort Men Get $40,000

FLINT, Dec. 30—Three hundred or more men and women sat down to a Christmas dinner in Flint. The occasion of this dinner was not only to meet and eat and exchange greetings, but to distribute $40,000 among 111 employees of the Durant-Dort Carriage Co. The recipients of bonuses were men and women who had worked continuously in the company's service for six years or more, and the size of the checks passed out ranged from $60 up to more than $2,500.

The plan under which the distribution was made is known as the "Loyalty and Merit" plan and was originated and executed by J. D. Dort, now president of the Dort Motor Car Co.

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Philadelphia-Atlantic City Passenger Airplane Route

PHILADELPHIA, Dec. 28—An airplane route to Atlantic City is planned, the cost of transportation to passengers to be $50 one way, but if a passenger decides to make a round trip $25 will be deducted on the return. Construction of a hangar and factory with a 25-ft. beach front has been started near the inlet. It is expected that the company will begin carrying passengers soon after Easter.

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Commercial Plane Service Planned

CHARLOTTETOWN, P. E. I., Dec. 30—At a meeting of business men of this city yesterday it was resolved that a company be formed to be known as the Prince Edward Island Aerial Transportation Co., capitalized at $25,000. A committee of five was appointed to solicit subscriptions and organize if the necessary financial support was forthcoming. The initial route proposed is Moncton, Summerside, Charlottetown, Georgetown, Pictou, New Glasgow and Halifax, with a double daily service summer and winter. Mails and express are to be handled first and later passengers. The proposition was submitted to the meeting by Major Kennedy, of the Royal Air Service, expert of the Aircraft Company, with headquarters in London.

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Norway Good Car Market

WASHINGTON, Dec. 30—Bergen, Norway is reported by Consular R. C. Busser, as an excellent market for passenger cars and motor trucks, for which it is said there is a great demand. Bergen merchants and inhabitants generally have enjoyed prosperous business although in some lines operations have ceased because of lack of raw materials.

Fuel Important at S. A. E. Meeting

Subject Will Have Prominent Place—Program Rapidly Being Completed

NEW YORK, Dec. 30—The program for the winter meeting of the Society of Automotive Engineers to be held in the Engineering Societies Building, New York, Feb. 4-6, is rapidly rounding into shape. Among other engineering discussions considerable time will be devoted to the fuel situation, and it is stated that an authoritative statement regarding the new "Liberty" fuel will be made.

The fuel discussion will be led by President C. F. Kettering, who will summarize the situation to date with particular reference to the need for improving the thermal efficiency of engines. In addition, there will be an analysis of the supply of petroleum in the United States by a representative of the United States Geological Survey and a discussion of modern refinery practice. Dr. Joseph E. Pogue, of the Bureau of Oil Conservation of the Bureau of Mines, will present an interpretation of the fuel situation.

It is expected that that portion of the sessions devoted to aircraft matters will be of prime importance. J. G. Vincent, formerly lieutenant-colonel and chief of the airplane engineering division of the Bureau of Aircraft Production, will deliver a paper on engines of the fixed type with radially arranged cylinders. He will also give a lot of information on the Liberty engine in addition to what has already become public. A paper on proportioning planes to their engines is in course of preparation.

Henry M. Crane, vice-president and chief engineer of the Wright-Martin Aircraft Corp., will address the gathering on the effect of aeronautic experience on automobile design and construction.

Major Arthur B. Brown is scheduled to present a paper on Better Truck Performance. The future development of lighter and more efficient passenger cars will be discussed by A. Ludlow Clayden, consulting engineer of the Wright-Martin Aircraft Corp. D. McCall White will talk on light, efficient automobile engines.

It is planned to cover tractor engineering in a comprehensive manner, and it is expected that a number of hitherto hidden matters with regard to the development of war automotive apparatus may be revealed.

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Imports and Exports Modified

WASHINGTON, Dec. 26—Several additional modifications have been announced by the War Trade Board regarding tin, copper ore, shellac and shipments to the United Kingdom.

All restrictions on the export of tin and tin plate have been removed. The limitations on the import of mahogany, shellac, other lacs and on varnish gums have been lifted.

Applications for the import of copper ore will now be considered where the shipment originates and comes from Korea, Newfoundland, West Indies, France, England, West Coast of South America, Cuba, Canada or Mexico, irrespective of the content of copper. Shipments will be allowed from Spain when containing more than 2 per cent of copper. Copper concentrates will be allowed for import from Cuba, Canada or Mexico irrespective of content and of copper concentrates from any non-enemy country other than these only when containing 50 per cent or over of copper. All restrictions on the import of copper matte or blister copper are removed.

Individual licenses for shipments to the United Kingdom will no longer be referred to the British War Mission in view of the elimination of the permit-to-purchase system by the Controller of Import Restrictions, London Board of Trade, which means that permits to purchase in England for import are no longer required.

Articles which are prohibited import, however, must be covered by an import license which can only be obtained by the consignee. Exporters are therefore advised before making shipment to obtain an import license from the consignee or learn definitely from the British Import Restrictions, Agricultural Machinery Department, or other department interested, that an import license is not necessary. Where the British permit to purchase has been issued it remains valid.

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Canada Wants Standard Gas Price

TORONTO, Dec. 30—A standard price for gasoline all over Canada is aimed at by the Retail Automobile, Garage and Accessory Dealers' Association. Acting through the Retail Merchants' Association they are taking up the matter with the producing companies. At a meeting held the past week in Toronto it was reported that the firms that had been interviewed so far by the committee had reported favorably upon the proposal. The Ontario dealers are behind the move, and it is stated that the Western dealers are lending active co-operation and that dealers in all the Provinces want the standard price adopted.

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Good Business for Boston

BOSTON, Dec. 28—The uncertainty and indecision which hovered about the motor district in Boston among people about to buy cars who were holding off because they expected to see prices drop is disappearing. During the past few days the inquiries and callers have again become normal and sales are being booked for future delivery.

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New York Office for Twin City

NEW YORK, Dec. 30—The Minneapolis Steel & Iron Co. has opened a New York office in the Tribune Building, 154 Nassau Street.

MOTOR TRANSPORT CORPS EQUIPMENT

FLOATED TO A. E. F. BY TEN DAY PERIODS

Name of Vehicle	Capacity	Total Floated to July 1, 1918	July, 1918				Total to Aug. 1, 1918	August, 1918				Total to Sept. 1, 1918	September, 1918				Total to Oct. 1, 1918	October, 1918				Total to Nov. 1, 1918	November, 1918				Total to Dec. 1, 1918	Total Losses at Sea	Total Landed Overseas
			A	B	C	Total July		A	B	C	Total Aug.		A	B	C	Total Sept.		A	B	C	Total Oct.		A	B	C	Total Nov.			
MOTOR CARS																													
*Ford	Light	660	.....	.....	.....	.....	660	66	48	77	191	851	50	53	55	158	1009	131	288	260	682	1691	42	243	134	419	2110	9	2101
*Dodge	Medium	1145	.....	263	232	495	1640	91	143	89	323	1963	128	83	145	356	2319	382	72	62	516	2835	59	31	258	348	3183	231	2952
*Cadillac	Heavy	426	2	41	167	210	636	58	36	15	109	745	35	52	84	171	916	116	65	21	202	1118	54	112	136	302	1420	21	1399
Total		2231	2	304	399	705	2936	215	227	181	623	3559	213	188	284	685	4244	629	425	346	1400	5644	155	386	528	1069	6713	261	6452
Misc. American and foreign		1189	.....	1	.....	1	1190	.....	.....	.....	.....	1190	.....	.....	.....	.....	1190	.....	.....	.....	.....	1190	.....	.....	1	1	1191	12	1179
Total motor cars		3420	2	305	399	706	4126	215	227	181	623	4749	213	188	284	685	5434	629	425	346	1400	6834	155	386	529	1070	7904	273	7631
AMBULANCES																													
*Ford	Light	2611	.....	.....	40	40	2651	.....	16	3	19	2670	106	30	478	614	3284	121	500	178	799	4083	72	58	6	136	4219	30	4189
*G.M.C	Heavy	1381	55	127	132	354	1695	100	52	119	271	1966	3	.....	.....	3	1969	60	212	280	552	2521	56	187	475	718	3239	74	3165
Total		3992	55	127	172	354	4346	100	68	122	290	4636	109	30	478	617	5253	181	712	458	1351	6604	128	245	481	854	7458	104	7354
Misc. American and foreign		237	.....	.....	.....	.....	237	.....	12	.....	12	249	.....	.....	.....	.....	249	.....	.....	.....	.....	249	.....	.....	.....	.....	249	.....	249
Total ambulances		4229	55	127	172	354	4583	100	80	122	302	4885	109	30	478	617	5502	181	712	458	1351	6853	128	245	481	854	7707	104	7603
TRUCKS, LIGHT DELIVERY																													
*Ford	600 lbs.	1347	.....	13	62	75	1422	25	512	573	1110	2532	648	1128	911	2687	5219	397	166	122	685	5904	154	200	454	808	6712	.....	6712
TRUCKS, LIGHT REPAIR																													
*Dodge	1000 lbs.	151	2	40	1	43	194	44	47	100	191	385	31	1	2	34	419	65	10	18	93	512	125	6	312	443	955	65	890
†Dodge, Special OD		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23	132	155	155	75	67	29	171	326	.....	110	.....	110	436	24	412
Total		151	2	40	1	43	194	44	47	100	191	385	31	24	134	189	574	140	77	47	264	838	125	116	212	553	1391	89	1302
TRUCKS, CLASS AA																													
*G.M.C	¾ ton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	132	132	132	7	26	.....	33	165	.....	165
†Commerce	1 ton	.....	.....	.....	.....	.....	.....	29	.....	55	84	84	.....	2	37	39	123	4	31	51	86	209	2	2	38	42	251	.....	251
†White	1 ton	17	.....	20	1	21	38	.....	50	55	105	143	23	23	117	163	306	.....	72	13	85	391	2	182	174	358	749	16	733
Ford	¼ ton	1682	.....	.....	.....	.....	1682	.....	.....	.....	.....	1682	60	1	.....	61	1743	.....	28	1	29	1772	.....	.....	.....	.....	1772	.....	1772
Total		1699	.....	20	1	21	1720	29	50	110	189	1909	83	26	154	263	2172	4	131	197	332	2504	11	210	212	433	2937	16	2921
Misc. American and foreign		199	.....	.....	.....	.....	199	.....	.....	.....	.....	199	.....	.....	.....	.....	199	.....	.....	.....	.....	199	.....	.....	.....	.....	199	.....	199
Total, Class AA		1898	.....	20	1	21	1919	29	50	110	189	2108	83	26	154	263	2371	4	131	197	332	2703	11	210	212	433	3136	16	3120
Total, under 1½ tons		3396	2	73	64	139	3535	98	609	783	1490	5025	762	1178	1199	3139	8164	541	374	366	1281	9445	290	526	978	1794	11239	105	11134
TRUCKS, CLASS A																													
*White	1½ tons	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	94	2	161	257	257	283	233	292	808	1065	.....	1065
†Garford	1½ tons	418	4	10	25	39	457	24	.....	.....	24	481	.....	2	4	6	487	6	5	.....	11	498	.....	.....	.....	.....	498	.....	498
†Light aviation	1½ tons	152	84	78	192	354	506	360	4	.....	364	870	.....	25	9	34	904	157	2	196	355	1259	55	34	222	311	1570	.....	1570
†Pierce	2 tons	256	9	74	30	113	369	.....	.....	4	4	373	5	34	1	40	413	2	.....	.....	2	415	.....	58	2	60	475	10	465
Packard	1½ tons	377	.....	.....	.....	.....	377	.....	.....	.....	.....	377	.....	.....	.....	.....	377	.....	.....	.....	.....	377	.....	7	126	133	510	.....	510
White (Non-standard)	1½ tons	57	8	.....	.....	8	65	.....	.....	.....	.....	65	10	109	148	267	332	.....	.....	.....	.....	332	.....	.....	.....	.....	332	.....	332
Total		1260	105	162	247	514	1774	384	4	4	392	2166	15	170	162	347	2513	259	9	357	625	3138	338	332	642	1312	4450	10	4440
Misc. American and foreign		764	.....	.....	.....	.....	764	.....	.....	.....	.....	764	.....	.....	.....	.....	764	.....	.....	.....	.....	764	.....	.....	.....	.....	764	.....	764
Total, Class A trucks		2024	105	162	247	514	2538	384	4	4	392	2930	15	170	162	347	3277	259	9	357	625	3902	338	332	642	1312	5214	10	5204
TRUCKS, CLASS B																													
*Standard B	3-5 tons	30	.....	.....	.....	.....	30	10	80	12	102	132	191	407	538	1136	1268	171	1322	1069	2562	3830	946	850	832	2628	6458	.....	6458
†Heavy aviation	3 tons	787	.....	.....	2	2	789	61	.....	.....	61	850	.....	.....	.....	.....	850	119	188	116	423	1273	77	150	434	661	1934	.....	1934
†Packard	3 tons	1908	107	150	338	595	2503	185	243	121	549	3052	2	.....	89	91	3143	29	27	112	168	3311	93	49	26	168	3479	27	3452
†Mack	3½ tons	53	12	2	.....	14	67	.....	.....	.....	.....	67	.....	.....	.....	.....	67	.....	135	71	206	273	.....	5	.....	5	278	.....	278
†Biker	4 tons	605	27	.....	23	50	655	223	47	39	309	964	1	37	131	169	1133	12	21	73	106	1239	21	79	9	109	1348	75	1273
†Pierce-Arrow	5 tons	829	.....	47	132	179	1008	200	139	137	476	1484	110	.....	.....	110	1594	19	.....	25	44	1638	.....	1	20	21	1659	37	1622
†Mack	5½ tons	467	.....	107	73	180	647	72	.....	.....	72	719	26	3	24	53	772	32	47	88	167	939	286	68	21	375	1314	6	1308
White	3 tons	279	.....	1	.....	1	280	.....	.....	.....	.....	280	.....	.....	.....	.....	280	.....	.....	.....	.....	280	.....	.....	.....	.....	280	.....	280
Packard	5 tons	17	.....	.....	.....	.....	17	.....	.....	.....	.....	17	.....	.....	.....	.....	17	.....	.....	.....	.....	17	.....	.....	.....	.....	17	.....	17
White	5 tons	34	.....	.....	.....	.....	34	.....	.....	.....	.....	34	.....	.....	.....	.....	34	.....	.....	.....	.....	34	.....	.....	.....	.....	34	.....	34
Total		5009	146	307	568	1021	6030	751	509	309	1569	7599	330	447	782	1559	9158	382	1740	1554	3676	12834	1423	1202	1342	3967	16801	145	16656
Misc. American and foreign		2185	.....	.....	.....	.....	2185	.....	.....	.....	.....	2185	.....	.....	.....	.....	2185	.....	.....	.....	.....	2185	.....	.....	.....	.....	2185	15	2170
Total Class B trucks		7194	146	307	568	1021	8215	751	509	309	1569	9784	330	447	782	1559	11343	382	1740	1554	3676	15019	1423	1202	1342	3967	18986	160	18826

F. W. D. TYPE																												
†Nash	2 ton	2061	253	34	.....	287	2348	94	273	370	737	3085	219	250	104	573	3658	107	547	1025	1679	5337	522	355	491	1368	6705	59	6646
†F.W.D.	3 ton	939	.....	91	.....	91	1030	248	119	4	371	1401	10	113	116	239	1640	249	369	297	1545	3185	376	631	300	1307	4492	27	4465
Total		3000	253	125	.....	378	3378	342	392	374	1108	4486	229	363	220	812	5298	356	916	1952	3224	8522	898	986	791	2675	11197	86	11111
Grand total, all trucks		15614	506	667	879	2052	17666	1575	1514	1470	4559	22225	1336	2158	2363	5857	28082	1538	3039	4229	8806	36888	2949	3046	3753	9748	46636	361	46275
MOTORCYCLES																												
*Harley-Davidson		4257	13	1052	700	1765	6022	909	817	593	2319	8341	575	579	830	1984	10325	2304	1064	1353	4721	15046	599	481	1344	2424	17470	62	17320
*Indian															111	111	111	.....	.....	261	261	372	171	121	119	411	783	88	783
Cleveland	Solo	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total		4257	13	1052	700	1765	6022	909	817	593	2319	8341	575	579	941	2095	10436	2304	1064	1614	4982	15418	770	602	1463	2835	18253	150	18103
SIDECARS																												
*Harley-Davidson		2956	273	298	1277	1848	4804	974	1307	531	2812	7616	604	2118	680	3402	11018	1111	503	1013	2627	13645	1302	533	1281	3116	16761	272	16325
*Indian																												164 436
BICYCLES																												
*Westfield		8701	.....	38	1324	1362	10063	443	425	2244	3112	13175	2457	2602	.....	5059	18234	1252	.....	288	1540	19774	791	1548	1512	3851	23625	.....	23625
Miscellaneous		900	.....	.....	.....	.....	900	.....	.....	.....	.....	900	.....	.....	.....	.....	900	350	.....	.....	350	1250	.....	.....	.....	.....	1250	.....	1250
Total		9601	.....	38	1324	1362	10963	443	425	2244	3112	14075	2457	2602	.....	5059	19134	1602	.....	288	1890	21024	791	1548	1512	3851	24875	.....	24875
TRAILERS, all types		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	‡3094	205	526	59	790	3884	401	142	321	864	4748	277	162	349	788	5536	308	5228
Total, all vehicles		37121	576	2189	3474	6239	43360	3242	3063	4610	10915	57369	4895	6083	4125	15103	72472	6655	5382	1256	3954	91765	5070	5989	8087	19146	110911	1196	109715
Spare parts (in tons)		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	663	989	1190	2842	2842	676	3135	2770	6581	9423	1998	1705	2342	6045	15468	.....	15468

*Indicates Standard Vehicles. †Indicates Approved Temporary Substitute. Others are Miscellaneous Purchases. ‡Reported in inventory, August 24, 1918, Headquarters, M.T.C., A.E.F. Losses at sea reported by Embarkation Service. Sidecars not included in "Total, all vehicles."

Automotive Stock Transactions on the New York Exchange for 1918

(Corrected to Close, Dec. 20) (*Continued from page* 29)

Name	Highest		Lowest		Last	Net Change
Advance-Rumely	26¾	Nov.	11	Jan.	23¾	+ 9½
Advance-Rumely, pf	63	Nov.	25⅞	Jan.	59⅜	+31⅜
Ajax Rubber	72¼	Dec.	49	Jan.	66	+19
Allis-Chalmers	37	May	17¾	Jan.	32½	+13¾
Allis-Chalmers, pf	86½	May	72¼	Jan.	84¾	+12
Chandler Motor	109⅞	Dec.	68¼	Jan.	104	+36⅝
Fisher Body	43	June	26	Jan.	36	+11
Fisher Body pf	93	Dec.	70¼	Jan.	93	+18
General Electric	158½	Oct.	127¾	Jan.	148¾	+15⅞
General Motors	164	Aug.	106¾	Jan.	129	+24¼
General Motors, pf	88	Feb.	75⅜	Oct.	81¼	+ 1¼
Goodrich, B. F.	59⅞	Oct.	38	Jan.	55	+17¼
Goodrich, B. F., pf	104	Dec.	96	Jan.	100	+ 8
Int. Harvester	72	Feb.	53	Mar.	70	+13
Int. Harvester, pf	106½	Sept.	95	May	106	+14
Int. Harvester N. J.	138	Oct.	111½	Jan.	138	+26
Int. Harvester N. J., pf	112	July	104	Sept.	106¾	— ¼
Int. Harvester (new)	121	Nov.	104	Oct.	112	+ 7½
Int. Harvester (new, pf)	114⅝	Dec.	107	Oct.	114	+ 7
Kelly-Springfield Tire	72	Dec.	41	April	69¾	+25¼
Kelly-Springfield Tire, pf	90⅛	Dec.	76⅝	Feb.	90	+12½
Kelsey Wheel	35	Oct.	24⅝	July	27⅝	— ⅜
Kelsey Wheel, pf	90	Mar.	81	Jan.	90	+20
Lee Tire	24	Dec.	12	April	21¾	+ 7
Maxwell Motors	42½	Nov.	23½	Jan.	28	+ 3
Maxwell Motors, 1st pf	69⅞	Nov.	50	Dec.	50	— 6¼
Maxwell Motors, 2nd pf	32¾	Nov.	19	May	19⅛	— 3⅝
Pierce-Arrow	51¾	Nov.	34	Jan.	42⅞	+ 6⅜
Pierce-Arrow, pf	104	Dec.	89	Jan.	101¾	+11¾
Savage Arms	80½	May	52⅞	Dec.	52⅞	— 2⅛
Saxon Motor	18	Nov.	4¾	Aug.	7⅛	+ ⅛
Studebaker	72⅞	Nov.	33⅞	April	50	+ ½
Studebaker, pf	100	Nov.	80½	July	92¼	+ 1¼
Stutz Motor	55	Dec.	36½	Nov.	48¼	+10¾
U. S. Rubber	79¾	Dec.	51	Jan.	79¼	+26¾
U. S. Rubber, 1st pf	110	Dec.	95	Jan.	108⅞	+13⅞
Westinghouse Electric	47½	May	38½	Jan.	42¼	+ 1⅞
Westinghouse Electric, 1st pf	64½	Feb.	59	Jan.	64½	+ 7
White Motor	50	Nov.	36¾	Jan.	43	+ 6¾
Willys-Overland	30	Nov.	15½	Jan.	25	+ 4½
Willys-Overland, pf	89¼	Nov.	75	Jan.	87⅞	+14⅝

M. T. C. Shipped 110,911 Vehicles To A. E. F.

WASHINGTON, Dec. 31—The Motor Transport Corps of the United States Army shipped 110,911 vehicles, including motor trucks, passenger cars, ambulances, motorcycles, bicycles and side cars, to the American Expeditionary Forces from the beginning of the war to Dec. 1, 1918.

Of this number 1196 vehicles were lost by sinkings at sea.

During the same period 15,468 tons of spare parts were shipped, of which none were lost. These figures are contained in a report just completed by the Motor Transport Corps.

On pages 32 and 33 is the complete report.

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Capt. Finkenstadt Returns to Peace Duties

WASHINGTON, Dec. 30—Capt. E. R. Finkenstadt, Assistant Chief of the Truck Section, Motor Vehicles Division, Quartermaster Department, who was formerly assistant to Christian Girl, president of the Standards Parts Co., will complete his work here by Jan. 10 and at that time return to the Standard Parts Co. Capt. Finkenstadt was for many months Chief of the production of the B standardized truck, officially known as the Liberty truck.

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Combination Under Webb Bill

WASHINGTON, Dec. 31—That American manufacturers are commencing to take advantage of the Webb bill is evidenced by reports from the Federal Trade Commission. One of the first to cooperate for export trade is the office equipment industry. The Globe Wernicke Co., The B. L. Marble Chair Co., and the Commercial Furniture Co. have arranged a combination and filed a statement with the Federal Trade Commission. The statement shows that the concerns will appoint a joint representative to manage their association which will be known as the United States Office Equipment Export Association. Necessary funds for the enterprise have been contributed, with the Globe Wernicke company investing $10,000, the Marble company $5,000 and the Commercial company $5,000.

All foreign business of the three concerns excepting Canadian will pass through the association. The costs will be prorated among the three on the basis of volume of sales of each party through the association. Bad debts will be treated as joint expense.

British Post-War Cars Exhibit Radical Ideas

LONDON, Nov. 1 — By mail — Although British manufacturers of motor cars are still far removed from quantity production of motor cars, the trend toward post-war models is becoming more marked every day, and already some details of cars which before the war would have been considered nothing if not radical have been permitted to become public.

It is expected that aeronautic experience will have a profound effect on design and that lighter, more efficient cars will be the result. For example, it is stated that one manufacturer of international repute has designed a car fitted with a five-cylinder air-cooled radial engine and having a chassis which has many other departures from orthodox practice. The cylinders are set star-fashion around the crankcase. Another maker proposes to use a tubular frame carried on transverse semi-elliptic springs front and rear.

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Eagles Proved Fit for Navy

WASHINGTON, Dec. 28—Trials of Eagle boats have convinced Navy constructors that the little craft turned out by the Ford plant at Detroit to fight submarines are worthy of taking their place as permanent units of the fleet. It was learned yesterday that official reports to the Navy Department giving full details of the trials show that in speed, seaworthiness and maneuvering ability the new boats exceed all contract requirements.

An average sustained speed of 18.3 knots was made by the boat used in the tests. The vessel showed no signs of "buckling" when the speed was forced still higher for short periods.

Three Eagles recently sent through the Welland Canal into the Atlantic arrived at their destination on the coast after passing through two gales of unusual severity. The crews reported the boats had been more comfortable than certain types of destroyers and the hulls had not strained at any point. Most of the Eagles completed under the war contract will be utilized as gunboats.

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Commerce Guarantees Prices

DETROIT, Dec. 30—To eliminate the uncertainty of the price question, the Commerce Motor Truck Co. has guaranteed distributers against any reduction in the price of Commerce trucks that may be on order, in transit or on the floor of the distributer should a reduction in list price be made.

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Capital Issues Committee Inactive

WASHINGTON, Dec. 28—The Capital Issues Committee of the U. S. Treasury Department, which has controlled the sale of stock and bond issues during the war, will discontinue active work beginning Dec. 31, 1918, and will remain as an inactive body to be called back to service if the need arises in the future. This committee has passed upon all stocks and bond issues planned during the war, deciding whether or not these were compatible with the national interests during the emergency. Its retirement at the end of the year means that with the new year the Government removes all restrictions on capital increases or the flotation of new companies, and so forth. The committee in announcing its inactive part in the future mentions the existence of numerous fraudulent plans for stock and bond sales and warns against them, asking for some special legislation to examine into and supervise all future capital issues.

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Foreign Drivers for 500-Mile Race

PARIS, Dec. 30—Special Cable—Already interest is awakening in the promised revivals of the 500-mile race on the Indianapolis Speedway which has been set for May 31. It is stated that probably four, and perhaps more, foreign drivers will start. Those who have indicated a desire to participate are Louis Wagner and Jack Scales, who probably will drive Fiats; Chassagne and Christianes, who likely will hold the wheels of British Sunbeam cars.

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All Garages Can Handle Ford Parts

DETROIT, Dec. 26—After Jan. 1 any garage can handle Ford parts and secure the regular dealers' discount on them. The Ford Motor Co. has been trying this method out in a limited way and has found it successful and intends to make it a plan of national scope starting on Jan. 1. This will not only increase the distribution of the Ford parts but will also in a broad way militate against the large number of so-called fake parts.

This is only another step in the Ford policy to broaden the sales policy to such a degree as to make the car and its parts almost a matter of general merchandising. The removal of territorial restrictions on Ford sales last year was the first step in this direction. There is no restriction on the part of the garageman regarding the number of parts nor the amount of money he need expend in laying in a stock.

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Contracts Placed

WASHINGTON, Dec. 28—Following is a list of contracts placed by the Motor Vehicle Division, Quartermaster Department, on Dec. 17, 1918:

Trailmobile Co., Cincinnati, 1000 cargo trailers, $596,000.
Goodyear Tire & Rubber Co., Washington, 5750 casings, 600 tubes, $230,720.
Kelly-Springfield Tire Co., Cleveland, 2000 tires, $80,680.
Fisk Rubber Co., Washington, D. C., 3765 casings, $57,003.50.
Firestone Tire & Rubber Co., Akron, 1965 casings, 5875 tubings, $76,874.25.
United States Tire Co., New York City, casings and tubes, $388,112.50.
Pennsylvania Rubber Co., Jeannette, Pa., 3000 casings, $31,500.

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Briscoe Price to Stand

NEW YORK, Dec. 30—The Briscoe Motor Car Co. has made public the fact that there will be no changes in the price of Briscoe cars before July 1, 1919.

Packard Prefers Returned Soldiers for New Workers

DETROIT, Dec. 28 — The Packard Motor Car Co. will give preference to the returned soldier's application for re-employment, in recognition of his service and his sacrifice. Since the declaration of war considerably more than 3000 Packard employees have left the factory to serve in the Army, Navy or in other departments of the Government. Some already released have applied for re-employment, and it is the company's wish to treat them all with a uniform consideration. The rules which Packard has adopted under the policy with reference to former employees who joined the colors are as follows:

An employee who left to enter Government service, and who has been honorably discharged, shall receive preference over other applicants for any vacancy which he may be competent to fill. Whenever possible, Packard employees honorably discharged from uniformed service will be assigned to their former positions or to work equally remunerative. If they are not able to resume their former occupation, every effort is to be made to place them in accordance with their present ability.

To facilitate the operation of this rule, department heads are authorized to replace whenever necessary employees who have entered Packard service since April 6, 1917. Applications for re-employment from employees who entered salaried civilian positions under the Government will be considered on their merits, and every effort will be made to provide employment if a suitable vacancy exists.

To receive consideration under these rules, an employee must have entered the Government service within 30 days of leaving Packard employ, and must make application for re-employment within 60 days of his discharge. In administering these rules, employees who have served under the governments of any Allied nations will rank equally with those who have been in United States service. Absence in Government service will not be deducted in determining length of service in Packard employ.

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American Chamber of Commerce in Buenos Aires

WASHINGTON, Dec. 28—The American Chamber of Commerce has been established in Buenos Aires, succeeding the American Commercial Club. It has 85 members who contributed 60,000 pesos as an initial fund in addition to annual dues of 240 pesos each. The organization is prepared to give information and advice to American manufacturers, to consider arbitration questions, and to assist the development of trade.

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Col. Wall Will Return to Peace Duty

WASHINGTON, Dec. 30—Lt. Col. W. G. Wall, who was the Chief Engineer of the National Motor Car Co., Indianapolis, and who during the war has been in the Ordnance Department engaged in the design and construction of tractors and tanks, will remain in Washington until Jan. 15 at which time he will resign to return to the National company in his former capacity as chief engineer.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

Evinrude May Expand

MILWAUKEE, Dec. 30—The Evinrude Motor Co., a pioneer manufacturer of detachable rowboat engines, expects to make a decision soon on the question of erecting and equipping a complete new plant at the northern limits of Milwaukee, a project which was to have been undertaken a year and a half ago, but indefinitely postponed because of conditions growing out of the declaration of a state of war. The company early in 1917 purchased a large tract of land for the proposed new plant and had prepared tentative plans for the new works. When this is built the Evinrude company intends to enlarge its line of production to include crude oil engines in various types, continuing its present principal product. J. F. Koch is treasurer of the company.

Export Office for Gibson

NEW YORK, Dec. 30—The Gibson Co., Indianapolis jobber, has opened an export office at 27 William Street. It is in charge of I. B. Moers until recently Pacificic Coast's manager for the King Motor Car Co., Detroit.

Bodies Coming from Milwaukee

MILWAUKEE, Dec. 30—The Wisconsin Body & Sales Co. has been incorporated with a capital stock of $15,000 to manufacture motor car and truck bodies for the commercial and custom trade. The incorporators are W. A. Rosenwald, G. Steger and B. M. Rosenwald.

Michigan City Foundry to Start

CHICAGO, Dec. 30—The Michigan City Foundry and Machine Co. will break ground here early in the spring for a foundry which will make a specialty of castings. Albert F. Fort is the moving spirit behind the venture and associated with him will be W. K. Greenebaum, as secretary of the company.

Becker Mfg. Co. Incorporates

MILWAUKEE, Dec. 30—The Becker Mfg. Co., Two Rivers, Wis., which has been operating an iron foundry in that city for many years, has incorporated its business under the same style, with a capital stock of $25,000. Michael P. and Frank T. Becker, the principal owners, continue to hold the controlling interest and will be the officers of the new corporation.

To Sell Monroe Plant

PONTIAC, MICH., Dec. 28—The plant of the defunct Monroe Motor Co. will be sold on the premises Saturday, Jan. 25, 1919, by the receiver, Robert T. Armstrong. The factory contains 100,000 sq. ft. of floor space.

Coast Office for Wellman-Seaver-Morgan

CLEVELAND, Dec. 30—The Wellman-Seaver-Morgan Co. has opened a San Francisco office at 415-417 Rialto Building, in charge of Norman S. Ross. Business originating from California, Nevada west of the 115th meridian, lower California and the counties of Josephine, Jackson and Klamath in Oregon will receive the prompt attention of Mr. Ross.

Castings from Hartford, Wis.

HARTFORD, WIS., Dec. 30—A new gray iron and semi-steel foundry is being established here by Robert LaPointe and Samuel B. Powers, who have leased the casting shop erected and equipped several months ago by Irving L. Bonniwell. The foundry will be operated under the style of Hartford Foundry Co. and will specialize in automotive parts.

Hel-Fi Buys Motor Accessories

CHICAGO, Dec. 28—The Hel-Fi Co., Belvidere, Ill., has purchased and taken over the entire assets and business of the Motor Accessories Mfg. Co., formerly located at Marshalltown, Iowa, and will continue the manufacture and distribution of the Hel-Fi line of spark plugs. C. C. Eldridge, formerly president of the Motor Accessories company, is president of the new organization, which has been organized to provide for further financing.

Everwear Rubber Buys Plant

MILWAUKEE, WIS., Dec. 30—The Everwear Rubber Co., Milwaukee, organized recently with a capital stock of $200,000 to manufacture a patented semi-pneumatic inner tire, has purchased the plant of the Petley Rubber Mfg. Co., 241-247 Oregon Street, which has been manufacturing rubber bumpers, mechanical rubber goods and specialties. The Everwear company will continue that business as a department.

More Room for Gillette

EAU CLAIRE, WIS., Dec. 30—The Gillette Rubber Co., which some time ago established a new department for the manufacture of solid tires, is enlarging its works by the erection of a brick addition, 40 x 125 feet, to accommodate inspection, shipping and warehouse departments. The space thus released will be used for manufacturing.

Dividends

Pierce-Arrow Motor Car Co., quarterly, $1.25, payable Feb. 1.

Curtiss Aeroplane & Motor Co., semi-annual, 3½ per cent on preferred, payable Jan. 15.

Emerson-Brantingham Co., quarterly, 1¾ per cent, preferred.

Falls Tractor Engine Coming

MILWAUKEE, Dec. 30—The Falls Motors Corp., Sheboygan Falls, Wis., will place in operation on Jan. 2 a large plant addition representing an investment of more than $225,000, enabling it not only to increase its output of passenger and commercial car power units, but also to engage in the production of a special tractor type, heavy duty motor. A considerable volume of business in the new tractor engine has been booked, and with the other orders now in hand, the operation of the enlarged plant at full capacity for many months ahead already has been assured.

Mitchell Toolmakers Return

RACINE, Dec. 30—Between 100 and 150 toolmakers employed by the Mitchell Motors Co., returned to work Dec. 20 after a strike of 10 days' duration. Differences arose over working hours and these have been adjusted by federal labor conciliators. It is said the Mitchell company desired to establish a 10-hour day, but the men insisted on an 8-hour day, with time and one-half for overtime.

Stinson Tractor to Build

SUPERIOR, WIS., Dec. 30—The Stinson Tractor Co. will commence operations in its new assembling plant at Superior, Wis., on Jan. 2, with a force of about 60 operatives. The work of equipping the former plant of the Continental Motor Truck Co. in Superior has been completed and material and parts have been provided in sufficient quantity to insure a daily output of one tractor, which will be increased as rapidly as equipment and stock are sufficiently enlarged.

New York Office for Hess

BALTIMORE, Dec. 30—The Hess Steel Corp. has established a branch office at 50 Church Street, New York City. Daniel V. Foster, who is now representing the Hess corporation in that district, will be in charge.

Government Still Needs Tires

WASHINGTON, Dec. 30—Government purchase of tires for motor trucks in this country and abroad continue in large quantities. Orders were placed on Dec. 17 for $1,000,000 worth of tires with the Goodyear, Kelly-Springfield, Fisk, Firestone, United States and Pennsylvania tire companies. An order at the same time was given to the Trailmobile Co., for 1000 cargo trailers. Following is the list:

Trailmobile Co., Cincinnati, Ohio, 1000 cargo trailers, $596,000.

Goodyear Tire and Rubber Co., Washington, 5750 casings, 6000 tubes, $230,720.

Kelly-Springfield Tire Co., Cleveland, 2000 tires, $80,680.

Fisk Rubber Co., Washington, 3765 casings, $57,003.50.

Firestone Tire and Rubber Co., Akron, 1965 casings, 5875 tubings, $76,874.25.

United States Tire Co., New York, casings and tubes, $388,112.50.

Adopt Standards for Women

Department of Labor Specifies Equal Pay and 48-Hour Week—Complete Rules

WASHINGTON, Dec. 30—Standards have been arranged by the Department of Labor to deal with working conditions for women, including wages, hours, employment and training. Equal pay for equal work, 48-hr. week and joint negotiation between employers and groups of employees are among the standards. Inquiries regarding the employment of women and all problems connected with this can be addressed to the Woman in Industry Service, Department of Labor, Washington, D. C. Following is the complete outline of the standards as approved by Secretary of Labor Wilson:

Hours of Labor

1. **Daily hours.**—No women shall be employed or permitted to work more than eight hours in any one day or 48 hours in any one week. The time when the work of women employees shall begin and end and the time allowed for meals shall be posted in a conspicuous place in each work room and a record shall be kept of the overtime of each woman worker.
2. **Half holiday on Saturday.**—Observance of the half holiday should be the custom.
3. **One day of rest in seven.**—Every woman worker shall have one day of rest in every seven days.
4. **Time for meals.**—At least three-quarters of an hour shall be allowed for a meal.
5. **Rest periods.**—A rest period of ten minutes should be allowed in the middle of each working period without thereby increasing the length of the working days.
6. **Night work.**—No women shall be employed between the hours of 10 p. m. and 6 a. m.

Wages

1. **Equality with men's wages.**—Women doing the same work as men shall receive the same wages with such proportionate increases as the men are receiving in the same industry. Slight changes made in the process or in the arrangement of work should not be regarded as justifying a lower wage for a woman than for a man unless statistics of production show that the output for the job in question is less when women are employed than when men are employed. If a difference in output is demonstrated the difference in the wage rate should be based upon the difference in production for the job as a whole and not determined arbitrarily.
2. **The basis of determination of wages.**—Wages should be established on the basis of occupation and not on the basis of sex. The minimum wage rate should cover the cost of living for dependents and not merely for the individual.

Working Conditions

1. **Comfort and sanitation.**—State labor laws and industrial codes should be consulted with reference to provisions for comfort and sanitation. Washing facilities, with hot and cold water, soap, and individual towels, should be provided in sufficient number and in accessible locations to make washing before meals and at the close of the work day convenient. Toilets should be separate for men and women, clean and accessible. Their numbers should have a standard ratio to the number of workers employed. Workroom floors should be kept clean. Dressing rooms should be provided adjacent to washing facilities, making possible change of clothing outside the workrooms. Rest rooms should be provided. Lighting should be arranged so that direct rays do not shine into the workers' eyes. Ventilation should be adequate and heat sufficient. Drinking water should be cool and accessible, with individual drinking cups or bubble fountain provided. Provision should be made for the workers to secure a hot and nourishing meal eaten outside the workroom, and if no lunch rooms are accessible near the plant, a lunch room should be maintained in the establishment.
2. **Posture at work.**—Continuous standing and continuous sitting are both injurious. A seat should be provided for every woman employed and its use encouraged. It is possible and desirable to adjust the height of the chairs in relation to the height of machines or work tables, so that the worker may with equal convenience and efficiency stand or sit at her work. The seats should have backs. If the chair is high a foot rest should be provided.
3. **Safety.**—Risks from machinery, danger from fire and exposure to dust, fumes, or other occupational hazards should be scrupulously guarded against by observance of standards in State and Federal codes. First-aid equipment should be provided. Fire drills and other forms of education of the workers in the observance of safety regulations should be instituted.
4. **Selection of occupations for women.**—In determining what occupations are suitable and safe for women, attention should be centered especially on the following conditions which would render the employment of women undesirable if changes are not made:
   A. Constant standing or other postures causing physical strain.
   B. Repeated lifting of weights of 25 pounds or over, or other abnormally fatiguing motions.
   C. Operation of mechanical devices requiring undue strength.
   D. Exposure to excessive heat—that is, over 80 deg., or excessive cold—that is, under 50 deg.
   E. Exposure to dust, fumes, or other occupational poisons without adequate safeguards against disease.
5. **Prohibited occupations.**—Women must not be employed in occupations involving the use of poisons which are proved to be more injurious to women than to men, such as certain processes in the lead industries. Subsequent rulings on the dangerous trades will be issued.
6. **Uniforms.**—Uniforms with caps and comfortable shoes are desirable for health and safety in occupations for which machines are used or in which the processes are dusty.

Home Work

No work shall be given out to be done in rooms used for living or sleeping purposes or in rooms directly connected with living or sleeping rooms in any dwelling or tenement.

Employment Management

1. **Hiring, separations, and determination of conditions.**—In establishing satisfactory relations between a company and its employees, a personnel department is important charged with responsibility for selection, assignment, transfer or withdrawal of workers and the establishment of proper working conditions.
2. **Supervision of women workers.**—Where women are employed, a competent woman should be appointed as employment executive with responsibility for conditions affecting women. Women should also be appointed in supervisory positions in the departments employing women.
3. **Selection of workers.**—The selection of workers best adapted to the required occupations through physical equipment and through experience and other qualifications is as important as the determination of the conditions of the work to be done.

Co-operation of Workers

The responsibility should not rest upon the management alone to determine wisely and effectively the conditions which should be established. The genuine co-operation essential to production can be secured only if definite channels of communication between employers and groups of their workers are established. The need of creating methods of joint negotiation between employers and groups of employees is especially great in the light of the critical points of controversy which may arise in a time like the present. Existing channels should be preserved and new ones opened if required, to provide easier access for discussion between employer and employees.

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Champion Machine to Build

CLEVELAND, Dec. 30—The Champion Machine & Forging Co. has purchased a block of land adjoining its plant at 3695 East Seventy-eighth Street, on which a forgeshop is now being erected.

Canada Has 250,000 Motor Cars

Dominion Has One Car for Every 32 Persons—Eleven Manufacturing Plants

WASHINGTON, Dec. 30—Two hundred and fifty thousand automobiles are in use in Canada at present, according to a Consular Report, which states that in 1914 there were 67,415 and in 1917 there were 189,320 cars in use.

With an estimated population of 8,000,000 there is one passenger car in use at present for every 32 inhabitants, as against one for every 118 inhabitants 4 years ago. The number of cars in use in Ontario this year is estimated at 110,000.

Statistics have been compiled showing the occupations of car owners throughout the country, according to Consul Felix S. S. Johnson, Kingston, Ontario, and from this, says the report, it is apparent that 90 per cent of all the cars in use are owned by persons whose occupations are such that the automobile in their hands is a utility enabling them to do more and better work. Nearly one-half the cars in use are the property of farmers.

A preliminary report of a census of the automobile and other allied industries has been compiled by the Dominion Bureau of Statistics. The census covered the operations of establishments engaged in the manufacture of (1) automobiles, (2) automobile accessories and (3) automobile repairs.

The number of establishments classed as manufacturers of automobiles in Canada in 1917 was 11, in automobile accessories 24 and in repair work 497.

The total capital invested in these industries was $35,780,677, apportioned as follows: In automobiles $28,192,858, in accessories $3,155,893 and in repairshops $4,431,926.

The number of persons employed on salaries was 730 males and 174 females in automobile plants, 106 males and 21 females in accessory plants, and 254 males and 48 females in repairshops and garages. The total salaries paid were respectively $1,376,692 in automobile plants, $266,147 in plants making accessories and $334,780 in repairshops.

The number employed on wages in each class and the amount paid in wages were as follows:

	Number		
	Males.	Females.	Wages
Automobile plants	4,852	164	$4,862,779
Accessory plants	1,405	122	1,198,596
Repairshops	1,508	34	1,200,958

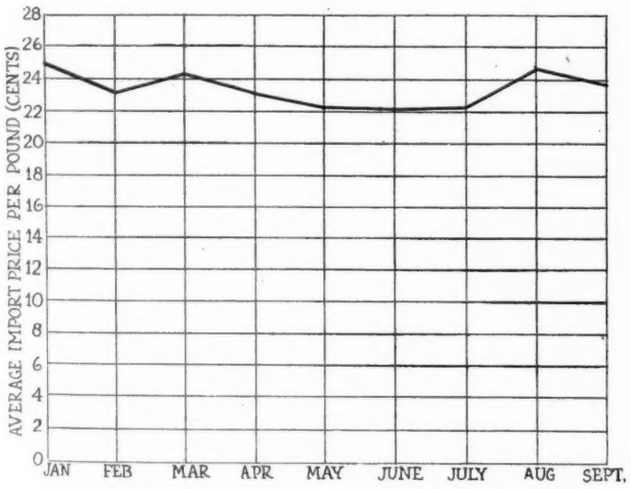
The value of materials used in manufacturing and repair work in each class was (1) automobiles $35,585,820, (2) accessories $3,788,308 and (3) repairs $1,961,773.

The total value of production and repair work for all classes was $66,053,207, of which automobiles amounted to $54,466,273, accessories to $6,495,868 and repairs to $5,091,066.

AUTOMOTIVE MATERIALS MARKETS

Materials Market Prices

Acids:
Muriatic, lb. ..... .02 -.03
Phosphoric (85%) .. .35 -.39
Sulphuric (60), lb.. .006
Aluminum:
Ingot, lb. ..... .33
Sheets (18 gage or more), lb. ..... .42
Antimony. lb. ..... .13 -.13¼
Burlap:
8 oz., yd..... .17¼-.17½
10½ oz., yd..... .21½-.22
Copper:
Elec., lb. ..... .26
Lake, lb. ..... .26
Fabric, Tire (17¼ oz):
Sea Is., combed, lb.1.65-1.70
Egypt, combed, lb.1.25-1.35
Egypt, carded, lb.1.20-1.30
Peelers, combed, lb.1.05-1.20
Peelers, carded, lb. .95-1.05
Fibre (⅛ in. sheet base), lb. ..... .50
Graphite:
Ceylon, lb. ..... .09 -.22
Madagascar, lb. ... .10 -.15
Mexico, lb. ..... .03¾
Lead, lb. ..... .06¾-.07¼
Leather:
Hides, lb. ..... .18 -.35¼
Nickel, lb. ..... .40
Oil:
Gasoline:
Auto, gal. ..... .24½
68 to 70 gal..... .30½
Lard:
Prime City, gal..2.25-2.30
Ex. No. 1, gal...1.62
Linseed, gal. 1.58-1.59
Menhaden (Brown), gal. 1.35-1.36
Petroleum (crude),
Kansas, bbl. 2.25
Pennsylv'a, bbl...4.00
Rubber:
Ceylon:
First latex pale crepe, lb. ..... .58
Brown, crepe, thin, clear, lb. ..... .50
Smoked, ribbed sheets, lb. .... .56
Para:
Up River, fine, lb. .61
Up River, coarse, lb. ..... .36
Island, fine, lb.. .53
Shellac (orange), lb.. .70-.72
Spelter ..... .08¼
Steel:
Angle beams and channels, lb. .... .03
Automobile sheet (see sp. table).
Cold rolled, lb.... .06½
Hot rolled, lb..... .03½
Tin ..... .71-.72
Tungsten, lb. 2.00-2.50
Waste (cotton), lb... 12¾-.17



Monthly average import prices of copper—pigs, ingots, bars, etc.

AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only per 100 lbs.	Primes when seconds up to 15 per cent are taken per 100 lbs.
Automobile body stock.....	$5.95	$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20

Automobile Sheet Extras for Extreme Widths:
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.
Nos. 22 to 24 over 26 in. to 40 in., 40c per 100 lb.
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.

Black Sheet Extras to Apply to Narrow Widths:
Oiling, 10c. per 100 lb.
Patent leveling, 25c. per 100 lb.

Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.

Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.

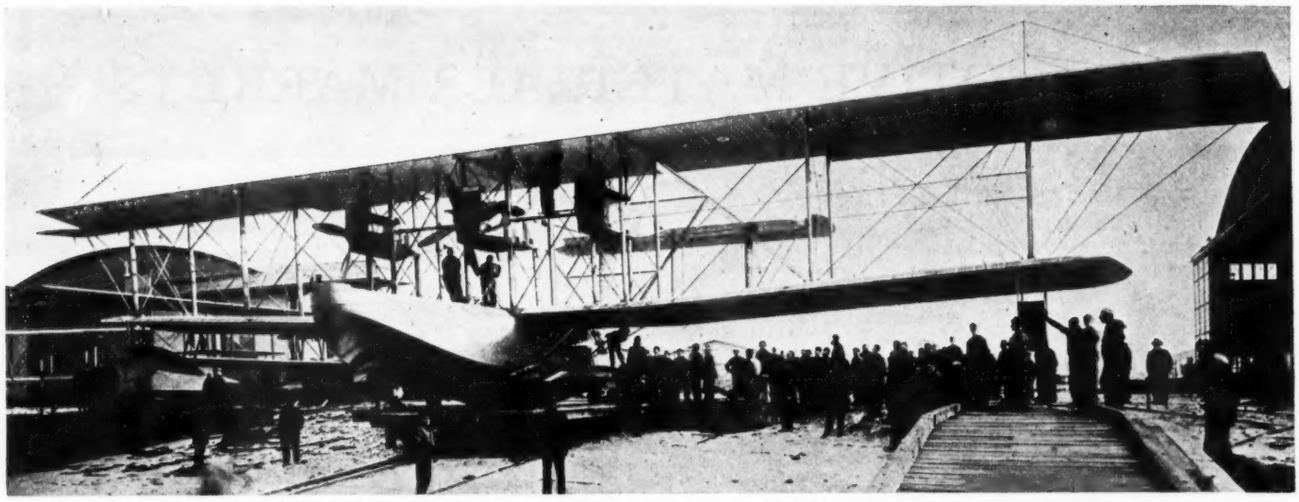
Automobile Securities on the Chicago Exchange at Close Dec. 28

	Bid	Asked	Net Ch'ge
Auto Body Company.....	5	8	..
Briscoe Motor Car, com.....	11	..	..
Briscoe Motor Car, pfd.....	40	55	..
*Chandler Motor Car.....102		104	—3
Chevrolet Motor Car.....149		151	..
Cole Motor Car Co.....	90	105	..
Continental Motors, com....	8	8⅝	..
Continental Motors, pfd.....	94	97	+2
Edmunds & Jones, com.....	20	22	..
Edmunds & Jones, pfd.....	75	90	..
Electric Storage Bat.....	49	57	..
Federal Motor Truck.....	32	35	..
Fisher Body Co., com.....	35½	38	..
Fisher Body Co., pfd.....	92	94	..
Ford Motor of Canada.....220		230	—15
General Motors, com.....129¾		130¾	— ¾
General Motors, pfd.....	79	81	—2
Hupp Motor Car, com.....	4½	5	..
*Hupp Motor Car, pfd.....	83	88	—1
Kelsey Wheel Co., com.....	26	30	..
Kelsey Wheel Co., pfd.....	85	90	..
Manhattan Electric S., com. ..		48	..
Maxwell Motor, com.....	27½	28½	—1½
Maxwell Motor, 1st pfd.....	50¼	51¼	—1⅞
Maxwell Motor, 2nd pfd....	19	20	—2
McCord Mfg., com.....	32	35	+2
McCord Mfg., pfd.....	93	96	+3
Mitchell Motor Co.....	25	35	..
Motor Products Corp.....	40	..	..
Nash Motors Co., com.....175		200	..
Nash Motors Co., pfd.....	90	95	..
National Motor Co.....	9	12½	..
Packard Motor Car, com....107		..	—1
Packard Motor Car, pfd.....	98½	..	+1
Paige-Detroit Motor, com..	23¼	24¼	+ ¼
Paige-Detroit Motor, pfd...	8¾	9¾	..
Peerless Motor Truck.....	18	21	..
Pierce-Arrow Mot. Car, com.	42	43	+ ½
Pierce-Arrow Mot. Car, pfd..103		104	..
Premier Motor Corp., com..	5	..	..
Premier Motor Corp., pfd...	..	75	..
Prudden Wheel Company...	15½	17½	..
*Reo Motor Car Co.....	20½	21½	..
Republic M. Truck, com....	35½	38	..
Republic M. Truck. pfd.....	87	90	..
Saxon Motor Car, com.....	6	8	—1⅝
Scripps-Booth Corp.....	21	25	..
Stewart Warner Speed. Corp.	77½	79½	— ½
Stromberg Carburetor Co...	33	38	..
Studebaker Corp., com.....	50	51	—1¾
Studebaker Corp., pfd.....	90	92	..
Stutz Motor Car Co.....	48⅝	50⅝	—1¼
United Motors Corp.....	33¼	35¼	— ¼
*White Motor Co.....	44¼	45¼	+ ⅜
Willys-Overland, com.....	24⅝	25⅝	— ¼
Willys-Overland, pfd.....	88	89	..

RUBBER STOCKS

	Bid	Asked	Net Ch'ge
Ajax Rubber Co.....	66	68	..
Firestone T. & R., com.....136		140	+11
Firestone T. & R., pfd.....100		101½	+1
Fisk Rubber Co., com.....	70	75	+10
Fisk Rubber, 1st pfd.....	97	103	..
Fisk Rubber, 2nd pfd.....	85	95	—5
Fisk Rubber, 1st pfd. conv..	90	97	..
Goodrich, B. F., com.....	56	57	..
Goodrich, B. F., pfd.....103⅝		106	..
Goodyear T. & R., com.....221		230	+9
Goodyear T. & R., 1st pfd...103¼		106	..
Goodyear T. & R., 2nd pfd..102		104	+2
Kelly-Springfield, com.	68½	69½	..
Kelly-Springfield, 1st pfd....	80	91	..
Lee Tire & Rubber Co.....	23	24¼	..
Marathon Tire & Rubber...	..	55	..
Miller Rubber Co., com.....142		148	..
Miller Rubber Co., pfd.....	96	98	+1
Rubber Products Co.....	..	101	..
Portage Rubber Co., com...145		149	..
Swinehart T. & R. Co.....	50	60	..
U. S. Rubber Co., com.....	77	78	..
*U. S. Rubber Co., pfd.....109		110	..

*Ex Dividend.



The mammoth navy seaplane, which is designated N. C. 1, and which it is now admitted is being held in readiness for an attempt at a transatlantic flight. It is the first American plane to be equipped with three Liberty engines. The wingspread is 126 ft. and the length is 70 ft. from bow to tail. The wings have a gap of 12 ft. and are 12 ft. broad. The flying weight of the machine is 22,000 lb. and it has climbed to 2000 ft. in 10 min.

Government Price of Dodge Cars

WASHINGTON, Dec. 30—A supplementary contract made to Dodge Bros., Detroit, by the Quartermaster Department fixes the price of boxed Dodge cars for export at $51 per crate, on 1500 5-passenger cars, making a total allowance of $76,500 increase in contract No. A-46 for 1500 Dodge cars to $1,327,500. A supplement to contract A-45 calling for 500 Dodge cars at $478,000 includes allowance for crating at $59 per crate, increasing the contract $29,500 to a total of $507,500. Estimated on this basis Dodge 5-passenger cars on contract A-46 have been sold to the Government at a cost of $885 each while on contract A-45 the price was $856 each not including the cost of crating.

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Hong Kong Trade Good

WASHINGTON, Dec. 30—Trade in Hong Kong during the past 9 months has been satisfactory, according to a Consular report. Decreasing tonnage, due to the demand for shipping service elsewhere and increasing difficulty of securing supplies, have prevented any great pressure in favor of imports, while on the other hand, the high exchange value of silver has made it impossible to move most lines of Chinese produce. Nevertheless the Hong Kong industry including the shipyards, sugar refineries, knitting and preserve factories have done excellent business and exportation from the United States should find good trade there as quickly as shipping faciiities allow. Among the principal items imported to Hong Kong in the past 9 months were $300,000 worth of automobiles and parts.

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Foreign Trade Opportunities

WASHINGTON, Dec. 30—An agency is desired by a man in France for the sale of tractors and also by an individual in Switzerland. Further information can be secured on this by addressing the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., and mentioning Foreign Trade Opportunity Nos. 27,883 and 27,886.

A commission merchant is desirous to secure an agency of American motor cars and motor trucks. The Bureau of Foreign and Domestic Commerce will give further details on receipt of inquiries asking about Foreign Trade Opportunity No. 27,891.

An agency for the sale of motor car bodies, especially leather, varnishes and trimmings is desired by an individual in France—Foreign Trade Opportunity No. 27,902.

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Steel Available in Canada

WASHINGTON, Dec. 30—Millions of tons of steel will now be available for automobile and agricultural implement manufacture in Canada, according to a Consular report, which states that manufacturers in these lines, there are far behind in their orders. A reduction in the high wage of the war is expected but at the same time it is expected that there will be ample employment for all at good wages in Canada. Manufacturers, says the report, do not look for a drop in prices for some time.

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New Allen Sedan

FOSTORIA, Dec. 21—The Allen Motor Co. has brought out a new five-passenger sedan on its 112-in. wheelbase, standard chassis. It has disappearing side windows, staggered doors and a passageway between the front seats, and is upholstered in gray and green worsted with a gray top lining and carpet to match. The windows are fitted with silk roller curtains at the rear, and the interior upholstery is over double-decked cushion springs. There is an etched center dome light, robe strap, foot rest and full interior equipment.

The windshild is sloping, with full ventilating features, and has an adjustable rain visor. There is a ventilating fixture on the driver's door, and the door is locked by a thumb latch. On the right hand door there is a Yale lock.

The standard Allen chassis upon which this new sedan is mounted has a four-cylinder 3¾ by 5 engine, a two-unit Autolite starting and lighting system with Connecticut ignition, Stromberg carbureter, Borg & Beck clutch and a full Hotchkiss drive. Gasoline feed is by Stewart-Vacuum system from a 13-gal. tank at the rear. Tires are 33 by 4 and the car sells for $1,795 f.o.b. Ohio.

One of the features of the car is the rotary switch, whcih is mounted on the steering column, directly beneath the steering wheel, controlling the entire electric system, including the starter, ignition, head and tail lamps, dimmers and motor-driven horn. The light for the interior dome light is controlled by a switch within the rear compartment.

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Army Planes Head for Washington

WASHINGTON, D. C., Dec. 30—The four army training planes which flew across the continent from San Diego to Jacksonville, and which later flew the length of Florida and back, have started north to Washington, D. C. They left Dorr Field, Arcadia, Fla., at 3:30 p. m., December 27 and arrived at Daytona, Fla., at 6:00 p. m. the same day, flying the last hour of this leg in the rain. The fliers spent the night at Daytona and left this morning for the North. They will continue to collect data and statistics for the army air map and locate sites for landing fields as they proceed. Allowing time for this work and their stops for gasoline it is figured they should arrive at Bolling Field, Anacostia, about January 4.

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N. A. C. C. Meeting Jan. 8

WASHINGTON, Dec. 30—The next directors' meeting of the National Automobile Chamber of Commerce will be held in New York on January 8.

Men of the Industry

Changes in Personnel and Position

F. J. Pardee, for the past three years general sales manager for the Diamond T. Motor Car Co., Chicago, has been appointed Western sales manager of the company, and will open headquarters in San Francisco. A. J. Whipple, who has been a special representative of the company in Washington, D. C., has been made general sales manager.

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A. S. Canton, formerly purchasing agent for the automobile accessories department of the Oliver Bros. Co., New York, is now associated with the A. S. Canton Co., accessory jobber.

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Glenn B. Miller has been appointed general sales manager of the Nelson Motor Truck Co., Saginaw, Mich.

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Chester L. Newman, for 20 years manager of the Kansas City branch of the National Analine & Chemical Co., has bought stock in the Employers' Indemnity Corporation, Kansas City, and on Dec. 27 became vice-president of the corporation. He will manage the new department of reinsurance, which is growing rapidly. The department reinsures both insurance companies and firms which carry their own insurance, on automobile liability, employers' liability and compensation, carrying the excess above the maximum amounts which such reinsured concerns care to cover for themselves. The corporation also provides a special coverage in automobile collision insurance "as interest may appear."

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John F. Evans, Evans Motor Sales Co., National distributer in Detroit has been appointed representative of the Gillette Rubber Co. He will be general manager of the Detroit Gillette branch which will be styled Gillette Rubber Co. of Michigan.

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A. W. Dunop, connected with the railway sales department of the United States Light & Heat Corp., Niagara Falls, N. Y., has been promoted district manager and engineer in charge of the San Francisco branch.

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George L. Ritter has been appointed assistant sales and advertising manager of the Duplex Engine Governor Co., Brooklyn, N. Y. He was formerly secretary to the president of the company.

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T. B. Fogg has been appointed branch supervisor of the Garford Motor Truck Co., Lima, O., and is head of a new Department of Supervision.

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J. F. Bowman has been appointed Detroit sales manager of the Garford Motor Truck Co., Lima, O. He succeeds S. M. Williams who has taken charge of the company's new Highway Development Department.

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Wade H. Leach assumed the duties of general sales manager of the Dort Motor Car Co., Dec. 1. For the past 2 years he has been interested in the Chicago Motor Co., Chicago, Jordan distributer.

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A. G. Cameron, manager of the Goodyear Tire & Rubber Co. at St. Louis, has been promoted to charge of the Australasia trade. He will spend several months each year in the South Seas. P. D. Winnings, assistant manager at St. Louis, is in charge pending a permanent appointment.

C. L. Fox, assistant sales manager of the Saxon Motor Car Corp., Detroit, has returned from the officers' training school at Jacksonville, Fla., where he was in training in the Motor Transport Corps. He will resume his work at the Saxon factory Jan. 1.

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Leo Lunenschloss, for 6 years manager of the principal Wisconsin sales office of the Avery Co., Peoria, Ill., in Madison, Wis., has been promoted to the position of foreign sales agent, with headquarters for the time being at the Peoria works. He is succeeded by R. B. Lyman, Watertown, S. D., as manager at Madison.

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Horace N. Trumbull, who has recently received his discharge from the Engineers Officers' Training School at Camp A. A. Humphreys, Virginia, has been appointed advertising manager of the Wellman-Seaver-Morgan Co., Cleveland, Ohio. Before entering the service, Mr. Trumbull was advertising manager of the S. K. F. Ball Bearing Co., Hartford, Conn.

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Fred D. Williams, formerly head of the power specialties department of the H. W. Johns-Manville Co., and who associated himself with the L. H. Gilmer Co., Philadelphia, as assistant general manager on April 29 last, has now been appointed general manager.

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Prohibit All Price-Fixing

WASHINGTON, Dec. 30—Concerted price fixing by any industry after the Government ceases to exercise price control on Jan. 1, will be regarded as in restraint of free competition by the Department of Justice, it was stated to-day. This explanation was made in reply to an inquiry as to what would happen to war time price fixing when the War Industries Board ceases to function on Dec. 31.

Front Entrance Inside Drive Body

(*Continued from page* 5)

only 48½ in. between floor and roof. This is 3½ in. less than would be considered fair or average height, but the design must be lower than usual, as the body is short, and this makes it look pyramid-like unless the perpendicular dimension is cut down.

This design is intended to use the regular form of metal panel and wood frame construction with a heavy line molding at the belt or middle, and a slight round corner at the rear. It can, however, be considerably modified in weight if the material forming the back and side quarters be of cloth as well as the roof. This construction will be used in the near future, as there is a strong tendency now to have the upper part of the body lighter. There is no reason from the standpoint of durability or comfort that will prevent it, but it is at present thought to be so radical that builders hesitate to suggest it. So far no material is just satisfactory; the khaki cloth is the best-looking material and is satisfactory in keeping out the rain and cold, but it does not wear well; it loses its clean-cut appearance in a short time and cannot be satisfactorily and easily cleaned to look like new.

Of many other materials, principally black in color, the same objection exists as far as service is concerned. Nearly all look cheap when used for this purpose; leather is ideal for appearance and service, but is not cheap, considering the length of time that it will stay in shape. When any of the cloth or leather materials are used the body is made square cornered at the rear, as this is more practical, as well as more easily constructed.

The design has been made to accommodate the prevailing tendency to make the most lasting job—that is, with the metal panel construction; the short digression above is simply to help in a missionary way the wish of all body builders to have the bodies made lighter than they now are, and when the public shares to the same extent the views of the practical man this will be quite easy of accomplishment.

Dealers Who Will Exhibit at New York Show Feb. 1-15

Car	Exhibitor	Space	Building
Apperson	C. T. Silver and L. A. Mulford Co.	61 & 62	Armory
Buick	Buick Motor Co.	13	Garden
Buick	Buick Motor Co.	60	Armory
Cadillac	Detroit Cadillac Motor Car Co.	3	Garden
Chalmers	Chalmers Sales Co.	4	Garden
Chandler	Brady-Murray Motors Corp.	8	Garden
Chevrolet	Chevrolet Motor Co. of New York	28	Garden
Cole	Russell L. Engs.	27	Garden
Crow-Elkhart	Crow Motor Sales Co.	74	Armory
Cunningham	Cunningham Auto Sales Co.	78 & 79	Armory
Daniels	A. Elliott Ranney Co.	11	Garden
Dodge	Colt-Stratton Co.	23	Garden
Franklin	Franklin Motor Car Co.	64	Armory
Haynes	Haynes Automobile Co. of New York.	9	Garden
Hudson	Hudson Motor Car Co. of New York.	75 & 76	Armory
Hupmobile	Hupmobile Auto. Co. of New York.	54	Armory
Jordan	McCurdy-Brainerd Co., Inc.	72	Armory
King	King Car Corp. of New York.	77 & 78	Armory
Kissel	Crown Motors Corp.	61 & 62	Armory
Lexington	Lexington Motors New York Corp.	55 & 56	Armory
Locomobile	Locomobile Co. of America.	18	Garden
Marmon	Marmon Auto. Co. of New York.	16	Garden
Maxwell	Maxwell Motor Sales Corp.	62 & 63	Armory
McFarlan	McFarlan Six Sales Co.	51 & 52	Armory
Mercer	Whiting Motor Co.	32	Garden
Mitchell	Mitchell Motor Car Co. of N. Y.	10	Garden
Moon	Moon Motor Car Co. of New York.	6	Garden
Murray	Morton W. Smith Co., Inc.	68	Armory
Nash	Kauffman-Morris Co.	52 & 53	Armory
National	Poertner Motor Car Co.	12	Garden
Oakland	Sidney B. Bowman Auto. Co.	22	Garden
Oldsmobile	Cutting-Larson Co.	19	Garden
Overland	Willys-Overland	5	Garden
Owen Magnetic	Owen Magnetic Car Co.	66 & 67	Armory
Packard	Packard Motor Car Co.	14	Garden
Paige	Paige-Detroit Co. of New York.	65 & 66	Armory
Pierce-Arrow	Harrolds Motor Car Co.	20	Garden
Peerless	Van Cortlandt Vehicle Corp.	2	Garden
Reo	Reo Motor Car Co. of New York.	33	Garden
Roamer	Roamer Motor Car Co.	56 & 57	Armory
Saxon	Saxon Motor Co. of New York.	73	Armory
Scripps-Booth	Poertner Motor Car Co.	12	Garden
Standard	Taylor Motors Corp.	58	Armory
Stearns	F. B. Stearns Co.	15	Garden
Stutz	William Parkinson Motor Sales Co.	21	Garden
Studebaker	Studebaker Corp. of America.	1	Garden
Velie	Garland Auto. Co.	31	Garden
Westcott	Allen-Westcott Motor Car Co.	59	Armory
Winton	Winton Co.	17	Garden

48 Get New York Show Space

(*Continued from page 29*)

In Madison Square Garden a balcony will be built, but not as large as that used in former years. It will house the accessories. Instead of cars being placed on a balcony in the Garden as heretofore there will be a second show in the Sixty-ninth Regiment Armory, a few steps from the Garden. A two-piece ticket will admit to both buildings. This will permit all the cars to be shown on the ground floor.

So far as the shows are concerned the visitor will never know whether they are promoted by the N. A. C. C. or the dealers. The old cars, the old faces and all the old atmosphere will be there. The Chicago show even has the manager of other years, Sam Miles, who was engaged a few days ago to manage that exposition.

In the drawing for the New York show, held at the Automobile Club of America last Saturday morning, the older members drew first, then a group of later members, and then the non-members who had made application. In addition to these there are quite a number of applicants expected, and there are only about a half dozen spaces left to allot.

The Chicago drawing was held at the Lexington at 3 o'clock Friday afternoon. There were 62 applications from passenger car dealers and 27 from truck companies. The New York truck drawings will not be held until Saturday of this week.

The receipts of the New York show will go to the New York Automobile Dealers' Association and the members. The receipts of the Chicago show will be divided among the Chicago Automobile Trade Association, the Chicago dealers, the N. A. C. C. and the Motor and Accessory Manufacturers' Association, which has sanctioned the Chicago and Boston shows. The New York show has not been sanctioned by the M. A. M. A.

The spaces allotted in the Chicago passenger car section follow:

Car	Space	Building
Overland	D-1	Coliseum
Buick	C-5	Coliseum
Dodge	B-2	Coliseum
Studebaker	A-6	Coliseum
Maxwell	B-6	Coliseum
Chevrolet	D-5	Coliseum
Cadillac	D-3	Coliseum
Hudson	B-4	Coliseum
Packard	C-1	Coliseum
Reo	C-3	Coliseum
Oakland	C-6	Coliseum
Chandler	A-2	Coliseum
Paige	A-4	Coliseum
Oldsmobile	D-2	Coliseum
Pierce-Arrow	C-2	Coliseum
Chalmers	B-5	Coliseum
Mitchell	K-1	Coliseum
Hupmobile	D-4	Coliseum
Franklin	A-3	Coliseum
Haynes	D-6	Coliseum
Marmon	C-4	Coliseum
Nash	A-k	Coliseum
Velie	E-2	Coliseum
Cole	F-3	Coliseum
Dort	F-4	Coliseum
Winton	F-1	Coliseum
Grant	E-1	Coliseum
National	B-3	Coliseum
Kissel	F-2	Coliseum
Stearns	G-1	Coliseum
Briscoe	A-5	Coliseum
Stutz	M-1	Coliseum
Peerless	A-1	Armory
Premier	E-3	Coliseum
Lexington	J-1	Coliseum
Scripps	E-4	Coliseum
Mercer	B-1	Coliseum
Fiat	B-4	Armory
Westcott	H-2	Coliseum
Paterson	Q-1	Coliseum
Moline	G-2	Coliseum
Liberty	O-1	Coliseum
Jordan	P-1	Coliseum
Stephens	H-1	Coliseum
Elgin	O-2	Coliseum
Holmes	N-3	Coliseum
Essex	Q-2	Coliseum
Locomobile	B-5	Armory
Daniels	Q-3	Coliseum
King	B-1	Armory
Case	B-3	Armory
Elcar	E-1	Armory
Davis	A-5	Armory
Standard	A-3	Armory
McFarlan	B-7	Armory
Biddle	C-1	Armory
Baker R. & L.	A-4	Armory
Owen Magnetic	A-2	Armory
Milburn	A-6	Armory
Detroit	A-8	Armory
Cunningham	B-6	Armory
Roamer	B-8	Armory

The Electric Vehicle Section heretofore set aside in the Armory will be continued. The concerns to which space is allotted in the truck sections follow:

Pierce-Arrow	Walker
G. M. C.	Paige
Autocar	Acme
Federal	Dearborn
Reo	La Peer
Nash	Republic
Garford	Indiana
Locomobile	Clydesdale
Kissel	Bethlehem
Maxwell	Brockway
Velie	Four Wheel Drive
Chevrolet	Shaw
Master	Graham Bros.
Service	Sandow
Dodge	

Post Office Motor Transport Service

WASHINGTON, Dec. 30—That there should be a Post Office Motor Transport Service connecting communities "like veins and arteries of the body," was the emphatic statement of Congressman M. Clyde Kelly Saturday before Congress. Mr. Kelly pointed out the important work performed in Europe during the war by the motor truck, and told how the soldiers were fed by motor transport. Using this description as a parallel instance, he stated himself emphatically in favor of the development of the Motor Transport Service in the United States.

Discuss Tax Elimination

WASHINGTON, Dec. 30—The Conference Committee representing the House and the Senate is now discussing the elimination from the Revenue bill of the 5 per cent tax on trucks, tractors, trailers and truck parts and it is expected that a satisfactory agreement will be reached to keep this from the bill. It is also considered possible that the 5 per cent tax on the parts and accessories of passenger cars will be removed.

National Tool to Make Trucks

ST. LOUIS, Dec. 30—The National Tool & Mfg. Co. is shortly to enter the market with a ¾ and a 1-ton truck. These will be placed on the market in six or eight months. The truck will be an assembled job.

Shop Committee Idea Spreading

WASHINGTON, Dec. 30—Shop committees for adjusting employees' grievances, and thus avoiding industrial disturbances, are being established and are working successfully in a number of American factories, according to bulletins issued by the Economics Division of the Information and Education Service, United States Department of Labor.

A large metal finishing plant in the State of New York started shop committees as a result of a strike, which it was found could have been avoided had there been means of discussion between the company and its men. Since the adoption of the plan every complaint has been adjusted satisfactorily. The plan is as follows:

Each department has an accredited representative on the committee, which elects an executive committee of five. The representatives meet every Friday, and two representatives of the management meet the executive committee in an office set aside for the purpose of discussing and adjusting grievances.

All complaints must be made in writing and submitted to the department representative by the complainant. The representative tries to adjust the matter with his foreman. If he fails he submits it to the next meeting of the shop committee. If the representatives can not adjust the grievance they turn it over to the executive committee, which takes it up with the representatives of the management. If they fail to agree the complaint is referred to the factory manager, who must take it up with a representative selected by the executive committee. In case this resort fails the dispute is passed on to an arbitration committee, whose decision is final and binding on both sides. The arbitration committee consists of five men, two selected by the management, two by the executive committee, and the fifth by these four.

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Hanch Quits Washington Jan. 15

WASHINGTON, Dec. 30—C. C. Hanch, Chief of the Automotive Section, War Industries Board, will probably complete his official duties in Washington by Jan. 15 and will at that time return to the Studebaker Corp., South Bend, Ind., of which Mr. Hanch is the treasurer. The Automotive Section is winding up its affairs as rapidly as possible, now completing a report in conjunction with the other sections of the board to be compiled into one complete statement of the board's activities by Bernard M. Baruch.

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To Provide Against Unemployment

WASHINGTON, Dec. 30—Felix Frankfurter, Chairman of the War Labor Policies Board, has been named by Secretary of Labor Wilson to take charge of the work of providing against unemployment "through stimulation of public works and state, county and municipal roads."

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"Rick" To Fly For Loan

WASHINGTON, Dec. 30—Eddie Rickenbacher, American ace in the Flying Service in Europe, may make a series of flights through the United States this spring under the auspicies of the Treasury Department at the time of the next Liberty Loan. The Treasury Department is now negotiating with the War Department on this matter.

Managers' School to Be Opened

Thirty Representatives from 15 States Convene in Washington January 6

WASHINGTON, Dec. 23—The U. S. Employment Service of the Department of Labor will open its first school for employment managers on Jan. 6. The course will extend over two weeks. Thirty employees of the Employment Service of the Government, representing 15 states, will attend the first school, and upon completion of the course will be returned to their own state, where they will train their own examiners for service.

The purpose of the course is to produce a trained and efficient staff to make standard the use of a common agency under the Government for labor distribution and placement. Following are the subjects to be covered:

First Day—Explanation of Reasons for and Methods of Conference and Training in State. Purpose and Development of U. S. Employment Service. Present Industrial Conditions. Competitive Basis but maintaining Advanced Standards gained in War Periods. Necessity for knowing Local Conditions. The limited but vital part of the Employment Bureau in the field of Industrial Adjustment.

Second Day—Round Table on Office Layout. General Discussion of Work to Date. Functions of Director General. Contacts with Department of Labor, etc. What the Examiners Should Note in Modern Industrial Production. Special Agencies with Which Examiners Must Work. Need for Local Survey of Community. Industrial, Labor and Government Agencies. Knowledge of Their Standards.

Third Day—Round Table on Interviewing and Placement. Plans for Demobilization of Soldiers and War Workers. Enlightened Industry and the U. S. Employment Service.

Fourth Day—Interviewing Placement. Fiscal and Personal Regulations. Special Considerations in Placing Women.

Fifth Day—Round Table on Special Departments. Field Organization. Co-ordination of Sections and Groups within Service. The Examiner and his contact with employers, organized Labor and the Service.

Sixth Day—Trade Tests. The Morale of the Service. Dinner and good fellowship.

Eighth Day—Functions of Federal Director State Organization — Contact with Labor and Jobs. Clearance in States. Round Table on Reports and Forms. Trade Tests.

Ninth Day—Organization of Local District. Labor Community Boards. Survey of Community Needs and Possibilities. Clearance Summing Up. Round Table on Files and Filing.

Tenth Day—Organization and Work in Local Office. Sources of Work. Round Table on Job Soliciting. Employment Experiences Abroad and Successful Extension Here.

Eleventh Day—Special Problems in Junior Placement. Special Problems Relating to Handicapped. Round Table on Recruiting.

Twelfth Day—Round Table on Casual Labor: Industrial, Railroad, Farm, Day Work (Domestic). The Organization of the Casual Labor Market. Written examination. Summing Up Course and Methods of Training in States. The Potential Permanent Value of the U. S. Employment Service.

Thirteenth Day— Individual Conferences. Instructions on Methods of Training and Rating Examiners.

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Moto-Meter Opens Detroit Branch

DETROIT, Dec. 30 — Following its policy of expansion, the Moto-Meter Co., Inc., Long Island City, New York, has opened a direct factory branch at 1432 Dime Bank Building, Detroit. The office will be in charge of J. J. Tobias.

Allied Tin Pact Broken by U. S.

WASHINGTON, Dec. 30—Cancellation of the inter-allied tin agreement has been announced by the War Industries Board. This places tin again under the control of the British Rubber and Tin Exports Committee. Negotiations for the protection of the American tin industry from price manipulation have been pending for many days between representatives of the tin industry and the importers favoring the inter-allied tin agreement, arrangements for which were not completed before Mr. Baruch and Vance McCormick left for Europe.

Prior to the negotiation of the inter-allied tin agreement the Rubber and Tin Exports Committee controlled the exports of tin from Great Britain and the export permits there were restricted to a limited number of merchants who enjoyed a monopoly thereby and were enabled to charge a premium of from 5 to 20 cents a pound.

At present the English market is about 10 cents below the American price and those favored concerns buying in England and selling here have enjoyed the high profit resulting. It may be necessary, it was said here to-day, to invoke the embargo power of the War Trade Board to secure equitable arrangements for the entire American tin industry.

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International Harvester Head Quits

CHICAGO, Dec. 31—Cyrus H. McCormick has been succeeded as president of the International Harvester Co. by his brother Harold F. McCormick. Cyrus H. becomes chairman of the board of directors, having been continuously affiliated with the International company for 32 years, 16 years as head of the concern and 18 years as head of the McCormick Co.

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Postpone Jobber Suit

NEW YORK, Dec. 31—The trial of the twenty-one members of the Automotive Equipment Association, formerly the National Association of Automobile Accessory Jobbers, on the charge of violating the Sherman anti-trust law has been postponed. It was originally scheduled for Jan. 6 but has been put off until Jan. 13 because Judge Hand, who is to try the case, is at present engaged with the Postal Telegraph demurrer action against the Government and will not be through with it until after Jan. 6.

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Buick Price Down $100

FLINT, MICH., Jan. 2—The Buick Motor Co. has revised its prices effective at once. Following are the new and old prices:

Model		New Price	Old Price
3-Pass.	open	$1495	$1595
5-Pass.	open	1495	1595
4-Pass.	closed	1985	2085
5-Pass.	closed	2195	2195
7-Pass.	open	1785	1885
7-Pass.	closed	2585	2585

No alteration has been made in the construction of the various models.

Calendar

ENGINEERING

S. A. E. Meetings

1919

Jan. 8—Minneapolis Section, S. A. E.—Hotel Radisson. "Governors for Tractors and Truck Engines."

Feb. 4-6—New York. Winter Meeting. Society of Automotive Engineers, Engineering Societies' Building.

Feb. 6—Victory Dinner, Hotel Astor, New York.

Feb. 5—Minneapolis Section, S. A. E. — Hotel Radisson. "Radiator Cooling Fans."

March 5 — Minneapolis Section, S. A. E.—Hotel Radisson. "Tractor Service and Sales."

April 2—Minneapolis Section, S. A. E.—Hotel Radisson. "Implements Designed for Tractor Belt Power and Their Characteristics."

MOTOR SHOWS

Jan. 11-18—Los Angeles, Cal. Automotive Exposition.

Jan. 15-18 — Spokane, Wash. Progressive Automotive Show in dealers' salesrooms. Auspices of Spokane Automobile Chamber of Commerce.

Jan. 20-25 — Hartford, Conn. Broad Street Armory. Auspices of Agricultural Interests.

Jan. 24-30 — Milwaukee, Wis. Eleventh Annual, Milwaukee Automobile Dealers, Inc., Auditorium. Bart J. Ruddle, Manager.

Jan. 25-Feb. 1—Chicago. Passenger cars, Coliseum.

February—Grand Rapids, Mich. Grand Rapids Automobile Business Assn. E. T. Conlon, Manager.

Feb. 1-15—New York. Automobile Dealers' Assn. Charles A. Stewart, Manager, Hotel Woodward, Broadway and 55th St.

Feb. 3-5 — Chicago. Trucks, Coliseum.

Feb. 10-15—Kansas City, Mo. Kansas City Motor Dealers' Assn. E. E. Peake, Manager.

Feb. 15 - 22 — Louisville, Ky. Louisville Auto Dealers' Assn.

Feb. 15-22—Newark, N. J. N. J. Auto Exhibition Co. Calude Holgate, Manager.

Feb. 15-22 — Cleveland, Ohio. Cleveland Auto Show Co. Fred H. Caley, Manager.

Feb. 15-22—Minneapolis, Minn. Minneapolis Auto Trade Assn. Walter B. Wilmot, Manager.

Feb. 15-22—Albany, N. Y. Albany Automobile Dealers' Assn. State Armory.

Feb. 17-22—Des Moines, Iowa. Tenth Annual, Des Moines Automobile Dealers' Assn. C. G. Van Vliet, Manager.

Feb. 17-22 — Passenger Cars; Feb. 24-27, Trucks—South Bethlehem, Pa. Lehigh Valley Auto Shows Co. I. Elliott, Manager.

Feb. 23-March 1—Cedar Rapids. Auditorium, Automobile Dealers' Assn.

Feb. 24-March 1—Kansas City, Mo.—Kansas City Motor Dealers' Assn. E. E. Peake, Manager.

Feb. 27-March 6—New York Aircraft Exhibition by Aircraft Manufacturers' Association, Madison Square Garden.

March — Scranton, Pa. Thirteenth Regiment Armory, Scranton Automobile Assn.

March—Pittsburgh. Automobile Dealers' Assn. of Pittsburgh. John J. Bell, Manager.

March—Utica, N. Y. Utica Motor Dealers' Assn. W. W. Garabrandt, Manager.

March — Great Falls, Mont.—Montana Automobile Distributers' Assn.

March—Philadelphia, Pa. Philadelphia Automobile Trade Assn. Passenger cars.

March 1-8—Detroit, Mich. Detroit Automobile Dealers' Assn. H. H. Shuart, Manager.

March 1-10—San Francisco, Cal. Motor Car Dealers' Assn. G. A. Wahlgreen, Manager.

March 3-8—Columbus, O. Columbus Automobile Show Co., Memorial Building. W. W. Freeman, Manager.

March 3-8—Buffalo, N. Y. Buffalo Automobile Dealers' Assn.

March 10-15—Syracuse, N. Y. Syracuse Automobile Dealers' Assn. Harry T. Gardner, Manager.

Second or third week March—St. Louis, Mo. St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Manager.

March 15-22 — Boston, Mass. Boston Automobile Dealers' Assn. Chester I. Campbell, Manager.

March 22-29, Passenger Cars; April 1-5, Trucks—Brooklyn. Brooklyn Motor Vehicle Dealers' Assn. I. C. Kirkham, Manager.

Third week March—Trenton, N. J. Trenton Auto Trade Assn. John L. Brock, Manager.

April 5-12—Montreal, Can.—National Motor Show of Eastern Canada, Victoria Rink. T. C. Kirby, Manager.

Not decided—Bridgeport, Conn. Auspices of City Battalion. B. B. Steiber, Manager.

Not decided — Harrisburg, Pa. Harrisburg Motor Dealers' Assn. J. Clyde Myton, Manager.

Not decided — Hartford, Conn. Hartford Automobile Dealers' Assn.

Not decided—Indianapolis, Ind. Indianapolis Auto Trade Assn. John B. Orman, Manager.

TRACTOR SHOWS

Feb. 24-Mar. 1—Kansas City, Mo. Fourth Annual Tractor Show. Sweeney Building, Kansas City Tractor Club. Guy H. Hall, Sec.

Feb. 18-22—Wichita, Kan. Annual Mid-west Tractor and Thresher Show, Wichita Tractor and Thresher Club. Forum.

CONVENTIONS

Feb. 4-6—New York. Meeting Society Automotive Engineers.

Jan. 7—New York. Dinner of Aircraft Manufacturers' Association, Waldorf.

Feb. 25-28—New York. Sixteenth Annual Convention. American Road Builders' Assn.

S. A. E. Members at the Plant of the Standard Aircraft Corp

Some of the members of the Society of Automotive Engineers who made up the excursion party that visited the plant of the Standard Aircraft Corp., Elizabeth, N. J., recently, where they were the guests of the company at a luncheon following an inspection of the factory and a number of flying demonstrations